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by

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16. ABSTRACT

The three-volume report compiles all data from EPA/IERL-RTP's phased environmental assessment program for the period 2/78-3/79. It includes data from 14 environmental assessment studies, compiled in standard format. The formatted Level 1 data are organized within each study by the analytical technique used to generate the data. Inorganic data as generated by spark source mass spectroscopy, atomic absorption, gas chromatography, chemiluminescence for oxides of nitrogen, anion analysis, and aqueous analysis precede the organic data generated by gas chromatography for C1-C6/C7 or C7-C17, liquid chromatographic fractionation, infrared spectroscopy, and low resolution mass spectroscopy. Sampling and analytical techniques that were used, that are not specified in Level 1, are documented in the summaries and data pages. Each Level 1 data section is followed by a Level 2 data section and/or an additional data section. Tables and figures in the Level 2 and additional data sections have been reproduced from the documents originally published by the organization conducting the study. The studies are organized by industrial type: (Vol. I) chemically active fluidized-bed combustion, coal-fired boiler and oil-fired boiler, coal-fired power plant, and coal gasifier; (Vol. II) coke production, and ferroalloy process; and (Vol. III) the remaining industrial processes.

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ABSTRACT

This document compiles all available data from the IERL Phased Environmental Assessment Program for the period February 1978 through March 1979. This document follows an earlier publication, EPA-600/2-78-211, Compilation of Level 1 Environmental Assessment Data, which compiled all available chemical data from the inception of the Environmental Assessment Program through March 1978.

Available data from 14 environmental assessment studies are compiled in this document in standard formats. The formatted Level 1 data are organized within each study by the analytical technique used to generate the data. Inorganic data as generated by spark source mass spectroscopy, atomic absorption, gas chromatography, chemiluminescence for oxides of nitrogen, anion analysis, and aqueous analysis precede the organic data generated by gas chromatography for C_1-C_6/C_7 or C_7-C_{17}, liquid chromatographic fractionation, infrared spectroscopy, and low resolution mass spectroscopy. Sampling and analytical techniques that were used that are not specified in Level 1 are documented in the summaries and data pages.

Each Level 1 data section is followed by a Level 2 data section and/or an additional data section. The tables and figures in the Level 2 and additional data sections have been reproduced from the documents originally published by the organization conducting the study.

Each study is introduced by a summary, which is followed by the data generated in that study. The studies are organized by industrial type as follows: Chemically Active Fluidized-Bed Combustion, Coal-Fired Boiler and Oil-Fired Boiler, Coal-Fired Power Plant, Coal Gasifier, Coke Production, Ferroalloy Process, Internal Combustion Engine, Iron and Steel Mills, Residential Heating, Shale Oil Retorting, and Textiles.

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INTRODUCTION

This document is an accumulation of all available environmental assessment data published from February 1978 through March 1979.

This document is the second comprehensive compilation of data from the IERL Phased Environmental Assessment Program. The first data compilation was published in October 1978 as EPA-600/2-78-211, Compilation of Level 1 Environmental Assessment Data. As in the first data compilation, the primary purpose of this compilation is to permit those involved in environmental assessment programs to evaluate the quality and quantity of data generated by the phased approach. It is felt that critical reviews of these data may lead to improvements in procedures, data formatting, data storage, and data interpretation. Although conclusions related to specific sources or source types may have been abstracted from the references to provide background information, the focus of this presentation is on data resulting from the Level 1 sampling and analytical methods. The interested reader should consult the referenced documents for more details and conclusions concerning pollutant sources, control techniques, etc.

The phased environmental assessment program, developed by the Industrial Environmental Research Laboratory (IERL) of the Environmental Protection Agency (EPA) at Research Triangle Park (RTP), North Carolina, is divided into three levels. Level 1 is the survey step to determine which samples from an environmental assessment might be hazardous or toxic. Level 1 also serves to establish the priority of samples and rank samples for further testing. When the Level 1 sampling and analysis scheme shows the possible presence of hazards, a Level 2 scheme is initiated to specifically identify and quantify suspected hazardous materials. If Level 2 reveals pollutants capable of environmental detriment, then a Level 3 scheme is begun to evaluate control technologies and to assess long-term effects.

Fourteen studies have been identified that contain phased environmental assessment data; these studies are organized alphabetically by source types in this compilation. It should be noted that each study included in this compilation will be identified as final draft, preliminary draft, etc., based on the completeness of the study summarized; therefore, absence of data does not necessarily indicate analysis was not performed but that the study was possibly not complete when it became necessary to compile the data. In each study, mention is made of methods used if they differ from the methodology specified in the IERL-RTP Procedures Manual: Level 1 Environmental Assessment (Second Edition), EPA-600/7-78-201.

Within each study, information is organized in the following manner:

I. Summary of the study

II. Level 1 data

- A. Inorganic analysis data
    1. Spark source mass spectroscopy (SSMS)
    2. Atomic absorption (AA) wet chemical methods--Hg, As, Sb
    3. Gas chromatography for inorganic gases
    4. Chemiluminescence for NO_x
    5. Anion analysis
    6. Aqueous analyses for pH, acidity, alkalinity, BOD, COD, DO, conductivity, dissolved and suspended solids, and other selected physical parameters
- B. Organic analysis data
    1. Gas chromatography for gases, b.p. <100° C (C_1-C_7)
    2. Gas chromatography for gases, b.p. >100° C (C_1-C_{17})
    3. LC fractionation
    4. IR
    5. Low resolution mass spectrometry (LRMS)

III. Level 2 data

IV. Additional data

Data in categories III and IV are photocopied from the referenced documents. Level 1 data are presented in standard format.

STUDY NUMBER 8

DATA SOURCE: **ENVIRONMENTAL ASSESSMENT OF COKE BY-PRODUCT RECOVERY PLANTS**

DATA STATUS: EPA—600/2-79-016, January 1979

AUTHORS: D. W. VanOsdell, D. Marsland, B. H. Carpenter, C. Sparacino, and R. Jablin

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U.S. Environmental Protection Agency
Research Triangle Park, NC 27711

The purpose of this study was to screen the solid, liquid, and gaseous discharges from coke byproduct recovery plants for their environmental effects. Coke byproduct recovery plants separate and concentrate the volatile compounds produced when coal is heated to form coke; these compounds include coal tar, ammonia, light oil (benzene, toluene, xylene, and other organics), coke-oven gas, and many other organic and inorganic components.

The study was performed in three phases. First, a very thorough evaluation was performed of information available from the literature, from other governmental testing, and from other studies. Approximately 60 pages of the report are devoted to detailed descriptions of the various coke byproduct recovery technologies, the accompanying pollution controls, and results of earlier analyses of effluents and emissions.

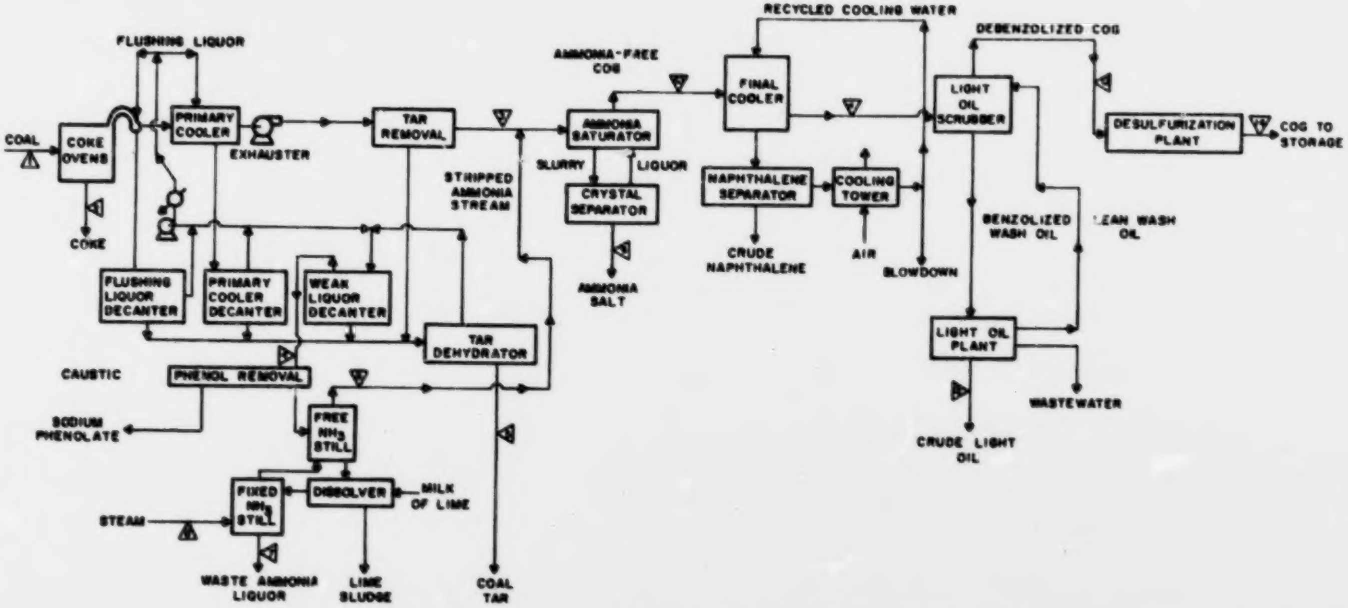
The Level 1 protocol was performed at the Fairfield Works, U.S. Steel Corporation, coke byproduct recovery plant. Figure 8-1 (from the final report) is a flow diagram of this plant showing the major process streams. Table 8-1 (from the document) shows the samples taken for analysis at this plant and the analyses performed on these samples.

This Level 1 environmental assessment focuses on organic vapor emissions because this was the area where the least amount of information was available. In addition to the specified Level 1 procedures, the following were performed: NaOH bubbler samplers for cyanide in gases by a colorimetric/$AgNO_3$ procedure; evacuated stainless steel canister samplers for benzene and benzene derivatives by GC-FID; and GC/MS on the SASS solvent concentrate for specific PNAs.

Based on the Level 1 and other sampling and analyses at the Fairfield plant, estimated pollutant emission rates were calculated for six major processes: tar processing, ammonia processing, dephenolization, final cooler/naphthalene handling, light oil recovery, and wastewater processing. The SAM/1A model was used to estimate the relative hazard of various processes; the biological treatment plant (wastewater) effluent was the most significant environmental hazard when emission rates were considered. Other major sources were the cooling tower for the contact final cooler and the biological treatment sludge.

A summary of the study's conclusions, taken from the final report, follows:

This study is a limited-scope first look at the by-product plant from the environmental point of view [underline added]. As such, it points to a need for control of light aromatics and PNA's. Control may be most likely achieved throught techniques that essentially eliminate the sources: venting tanks back to the gas mains; blanketing with coke oven gas. The potential for application of venting and coke oven gas blanketing should be determined by further study. Alternative technologies for dephenolization, cyanide handling, and desulfurization should be further studied with respect to their relative environmental impacts. Solid wastes present hazards in disposal that require further investigation. Wastewater treatment capabilities and effects need further delineation. Economic models of the annualized costs of alternative processes should be further developed to permit delineation of most cost effective technologies.


COAL
COKE OVENS
COKE
FLUSHING LIQUOR
PRIMARY COOLER
EXHAUSTER
TAR REMOVAL
FLUSHING LIQUOR DECANTER
PRIMARY COOLER DECANTER
WEAK LIQUOR DECANTER
TAR DEHYDRATOR
CAUSTIC
PHENOL REMOVAL
SODIUM PHENOLATE
FREE NH3 STILL
FIXED NH3 STILL
DISSOLVER
MILK OF LIME
STEAM
WASTE AMMONIA LIQUOR
LIME SLUDGE
COAL TAR
STRIPPED AMMONIA STREAM
AMMONIA-FREE COG
AMMONIA SATURATOR
SLURRY
LIQUOR
CRYSTAL SEPARATOR
AMMONIA SALT
FINAL COOLER
RECYCLED COOLING WATER
NAPHTHALENE SEPARATOR
CRUDE NAPHTHALENE
COOLING TOWER
AIR
BLOWDOWN
LIGHT OIL SCRUBBER
DEBENZOLIZED COG
BENZOLIZED WASH OIL
LEAN WASH OIL
LIGHT OIL PLANT
WASTEWATER
CRUDE LIGHT OIL
DESULFURIZATION PLANT
COG TO STORAGE

Mg/DAY	1 COAL	2 COKE	3 RAW GAS	4 NH LIQUOR	5 TAR	6 STRIP	7 WASTE LIQUOR	8 STEAM	9 SALT	10 COG	11 COG	12 COG	13 CRUDE LO	14 COG
CARBON SOLIDS	10,000[a]	7370												
WATER	500		100	900	8	110	1040	290		240	140	130		130
CARBON DIOXIDE			89	1		1				90	90	85		80
HYDROGEN SULFIDE			29	1		1				30	30	30		2
AMMONIA NITROGEN			15	3		5			20					
CYANIDE			4	1		1	TRACE			5	3	3		
CHLORIDE				1			1							
BASES: H_2, CO, CH_4, N_2, O_2, HC			1500							1500	1500	1500		1500
CARBON DISULFIDE			2							2	2		2	
LIGHT OILS			90		8					90	90	5	85	5
TAR ACIDS				1	10		TRACE							
TAR BASES			2		10					2	2		2	
POLYCYCLICS			1		340					1				
OTHER							Ca: 1		SO_4: 53					
TOTALS	10,500	7370	1840	910	380	120	1040	290	73	1980	1860	1780	90	1720
TEMPERATURE °C			80	30	30	95	105	130		45	30	30		30
PRESSURE, bars			1.1			1.1		2.7		1.05	1.04	1.02		1.0

a. BASIS: THE SCALE FACTOR TO DUNLOP AND McMICHAEL (36) IS 980
b. ROUNDED

Figure 8-1. Flowplan and material balance of a representative coke by-product recovery plant.

TABLE 8-1. COKE BY-PRODUCT RECOVERY PLANTS POLLUTANT SOURCES

Operation Emissions Source	Pollutants to:		
	Air	Water	Land
Tar Processing			
tar decanter	(x),f,P,LA,H_2S		(y),sludge
prim. cooler condensate tank	(x),f,NO,LA,H_2S		
tar dewatering and storage	(x),f,P,LA		(z),tar product
tar topping (distillation)	(y),f	(z),bar cond.	
tar distillation-product	(x),f,PI,LA		
tar distillation pitch			(y),pitch product
Ammonia Processing			
excess liquor tank	(z), f		
excess ammonia liquor	(x),P,LA		
phenol extraction	(z),f		(z),sludge
ammonia stills	(z),vent		
fixed still			(y),sludge
sulfate crystallizer-dryer	(z),f		
sulfuric acid storage tank	(z),f		
ammonium sulfate storage	(z),f		
Dephenolization	(y),f if vented to gas main	(z)	
Final Cooler, Naphthalene Handling			
cooling tower, for contact cooler	(x),P,HCN,LA		
hot and cold wells		(x),P,LA	
naphthalene separator (froth floatation)	(x),f,PI,LA		
naphthalene dryer	(y), vent	(z),water decanted	
Light Oil Recovery			
wastewater		(y)	
wash oil sludge			(y)

TABLE 8-1 (continued)

Operation Emissions Source	Pollutants to: Air	 Water	 Land
wash-oil storage	(z),f		
wash-oil decanters	(z),f		
light-oil storage	(x),f,LA,H_2S		
light-oil condenser vent	(z)		
Desulfurization			
by absorption		(y),absorption purge	
by wet oxidation		(y),absorption purge	
Cyanide Handling			
catalytic destruction waterwork	(z)		
regenerate or blown air ammonium polysulfide		(z)	
Coke Oven Gas, After Tar Removal		(x),C_1-C_6,LA,H_2S	
Biological Treatment Plant Feed		(x),Ph,P,LA,CN,Cl,SO_4,SCN	
effluent	(y)	(x),Ph,P,LA,SCN,CN,Cl,SO_4	
sludge			(x),Fe,Cl,Mg,F,Si,Al, etc. present (x),aliphatics, phenolics, sat. HC present
Plant Atmosphere			
Downwind-Upwind, concentration increase	(x)	(x),HCN:0.05-0.06 vppm	

Ph = phenols
LA = light aromatics (benzene, etc.)
NO = no organics sample
PI = polynuclear aromatic compounds may be present
P = polynuclear aromatic compounds present

f = fugitive
S = sludge
(x) = sample taken
(y) = sample not taken, but data available
(z) = sample not taken, data not available

LEVEL 1

TABLE 8-2. SPARK SOURCE MASS SPECTROSCOPY
BIOLOGICAL PLANT SLUDGE SAMPLE
(ppm)

U	<0.025	Dy	<0.016	Rh	<0.010	Cr	0.071
Th	<0.023	Tb	<0.016	Ru	<0.010	V	0.025
Bi	<0.021	Gd	<0.016	Mo	0.065	Ti	0.30
Pb	0.18	Eu	<0.015	Nb	0.003	Sc	
Tl	<0.020	Sm	<0.015	Zr	0.030	Ca	0.21%
Hg		Nd	<0.014	Y	0.006	K	12
Au	<0.020	Pr	<0.014	Sr	0.95	Cl	270
Pt		Ce	0.011	Rb	0.090	S	0.13%
Ir	<0.019	La	<0.014	Br	3.0	P	27
Os	<0.019	Ba	0.27	Se	6.4	Si	32
Re	<0.019	Cs	0.004	As	2.5	Al	24
W	<0.012	I	<0.03	Ge	0.81	Mg	96
Ta		Te	<0.013	Ga	<0.021	Na	0.10%
Hf	<0.018	Sb	0.014	Zn	2.0	F	26
Lu	<0.017	Sn	0.10	Cu	1.3	B	0.69
Yb	<0.017	In	*	Ni	14	Be	0.006
Tm	<0.017	Cd	0.19	Co	0.16	Li	0.23
Er	<0.017	Ag		Fe	210		
Ho	<0.016	Pd	<0.011	Mn	5.2		

TABLE 8-3. SULFUR SPECIES
Froth Flotation Separator

Sample	H_2S (COS)	SO_2	CS_2
Bulb #1	1504	ND	ND
Bulb #2	NA	NA	NA

NA = no analysis.
ND = compound not detected.

TABLE 8-4. SULFUR SPECIES
Final Cooling Tower

Sample	H_2S (COS)	SO_2	CS_2
Bulb #1	2.3	ND	ND
Bulb #2	2.4	ND	ND

NA = no analysis.
ND = compound not detected.

TABLE 8-5. SULFUR SPECIES
Tar Storage Tank

Sample	H_2S (COS)	SO_2	CS_2
Bulb #1	ND	ND	ND
Bulb #2	ND	ND	ND

NA = no analysis.
ND = compound not detected.

TABLE 8-6. SULFUR SPECIES
Tar Decanter Tank

Sample	H_2S (COS)	SO_2	CS_2
Bulb #1	3792	ND	ND
Bulb #2	4571	ND	ND

NA = no analysis.
ND = compound not detected.

TABLE 8-7. SULFUR SPECIES
Light Oil Storage Tank

Sample	H_2S (COS)	SO_2	CS_2
Bulb #1	22	ND	5-10 ppm (estimate)
Bulb #2	20	ND	5-10 ppm (estimate)

NA = no analysis.
ND = compound not detected.

TABLE 8-8. SULFUR SPECIES
Chemical Oil Storage Tank

Sample	H_2S (COS)	SO_2	CS_2
Bulb #1	ND	ND	ND
Bulb #2	ND	ND	ND

NA = no analysis.
ND = compound not detected.

TABLE 8-9. SULFUR SPECIES
Coke Oven Gas

Sample	H_2S (COS)	SO_2	CS_2
Bulb #1	4229	ND	ND
Bulb #2	5020	ND	ND

NA = no analysis.
ND = compound not detected.

TABLE 8-10. SULFUR SPECIES
Primary Cooler Condensate Tank

Sample	H_2S (COS)	SO_2	CS_2
Bulb #1	2350	ND	ND
Bulb #2	NA	NA	NA

NA = no analysis.
ND = compound not detected.

TABLE 8-11. SULFUR SPECIES
Upwind Ambient Trailer Location

Sample	H_2S (COS)	SO_2	CS_2
Bulb #1	0	0	0
Bulb #2	NA	NA	NA

NA = no analysis.
ND = compound not detected.

TABLE 8-12. SULFUR SPECIES
Downwind Ambient Chem Lab Site

Sample	H_2S (COS)	SO_2	CS_2
Bulb #1	0	0	0
Bulb #2	0	0	0

NA = no analysis.
ND = compound not detected.

TABLE 8-13. GAS CHROMATOGRAPHY ANALYSIS
Froth Flotation Separator

Sample	Range	Volume, ppm	No. of Peaks Observed
Bulb #1	GC1	1,425	1
	GC2	441	1
	GC3	155	4
	GC4	0.1	1
	GC5	13	5
	GC6	30	4
	GC7	-	0
Bulb #2	GC1	1,291	1
	GC2	373	1
	GC3	132	4
	GC4	-	0
	GC5	37	2
	GC6	212	1
	GC7	3	1

- = Compound not detected.

TABLE 8-14. GAS CHROMATOGRAPHY ANALYSIS
Final Cooling Tower

Sample	Range	Volume, ppm	No. of Peaks Observed
Bulb #1	GC1	2.9	1
	GC2	-	0
	GC3	-	0
	GC4	-	0
	GC5	-	0
	GC6	-	0
	GC7	-	0
Bulb #2	GC1	2.8	1
	GC2	-	0
	GC3	-	0
	GC4	-	0
	GC5	-	0
	GC6	-	0
	GC7	-	0

- = Compound not detected.

TABLE 8-15. GAS CHROMATOGRAPHY ANALYSIS
Tar Storage Tank

Sample	Range	Volume, ppm	No. of Peaks Observed
Bulb #1	GC1	6.6	1
	GC2	0.9	2
	GC3	0.1	1
	GC4	-	0
	GC5	-	0
	GC6	-	0
	GC7	-	0
Bulb #2	GC1	1.0	1
	GC2	0.8	2
	GC3	0.1	1
	GC4	-	0
	GC5	-	0
	GC6	-	0
	GC7	-	0

- = Compound not detected.

TABLE 8-16. GAS CHROMATOGRAPHY ANALYSIS
Tar Decanter Tank

Sample	Range	Volume, ppm	No. of Peaks Observed
Bulb #1	GC1	3,643	1
	GC2	880	1
	GC3	260	4
	GC4	0.1	1
	GC5	14.1	5
	GC6	31.5	3
	GC7	79	1
Bulb #2	GC1	3,640	1
	GC2	879	1
	GC3	257	4
	GC4	0.1	1
	GC5	14	5
	GC6	144	4
	GC7	97	1

- = Compound not detected.

TABLE 8-17. GAS CHROMATOGRAPHY ANALYSIS
Light Oil Storage Tank

Sample	Range	Volume, ppm	No. of Peaks Observed
Bulb #1	GC1	20	1
	GC2	35	2
	GC3	25	4
	GC4	1	1
	GC5	15	6
	GC6	25	6
	GC7	-	0
Bulb #2	GC1	20	1
	GC2	34	2
	GC3	25	4
	GC4	1	1
	GC5	17	6
	GC6	17	6
	GC7	0.1	1

- = Compound not detected.

TABLE 8-18. GAS CHROMATOGRAPHY ANALYSIS
Chemical Oil Storage Tank

Sample	Range	Volume, ppm	No. of Peaks Observed
Bulb #1	GC1	2.8	1
	GC2	-	0
	GC3	-	0
	GC4	-	0
	GC5	-	0
	GC6	-	0
	GC7	-	0
Bulb #2	GC1	2.8	1
	GC2	0	0
	GC3	0	0
	GC4	0	0
	GC5	0	0
	GC6	0	0
	GC7	0	0

- = Compound not detected.

TABLE 8-19. GAS CHROMATOGRAPHY ANALYSIS
Coke Oven Gas

Sample	Range	Volume ppm	# of Peaks Observed
Bulb #1	GC1	66,190	1
	GC2	11,110	1
	GC3	1,093	3
	GC4	1	1
	GC5	43	6
	GC6	124	4
	GC7	-	0
Bulb #2	GC1	66,992	1
	GC2	11,598	1
	GC3	1,159	3
	GC4	1	1
	GC5	44	6
	GC6	168	4
	GC7	-	0

= compound not detected.

TABLE 8-20. GAS CHROMATOGRAPHY ANALYSIS
Primary Cooler Condensate Tank

Sample	Range	Volume ppm	# of Peaks Observed
Bulb #1	GC1	1,357	1
	GC2	349	1
	GC3	139	4
	GC4	-	0
	GC5	7	3
	GC6	13	2
	GC7	53	1
Bulb #2	GC1		
	GC2		
	GC3		
	GC4		
	GC5		
	GC6		
	GC7		

- = compound not detected.

TABLE 8-21. GAS CHROMATOGRAPHY ANALYIS
Upwind Ambient Trailer Location

Sample	Range	Volume, ppm	No. of Peaks Observed
Bulb #1	GC1	2.9	1
	GC2	-	0
	GC3	-	0
	GC4	-	0
	GC5	-	0
	GC6	-	0
	GC7	-	0
Bulb #2	GC1		
	GC2		
	GC3		
	GC4		
	GC5		
	GC6		
	GC7		

- = Compound not detected.

TABLE 8-22. GAS CHROMATOGRAPHY ANALYSIS
Downwind Ambient Chem Lab Site

Sample	Range	Volume ppm	# of Peaks Observed
Bulb #1	GC1	3.4	1
	GC2	-	0
	GC3	-	0
	GC4	-	0
	GC5	-	0
	GC6	-	0
	GC7	-	0
Bulb #2	GC1	3.1	1
	GC2	-	0
	GC3	-	0
	GC4	-	0
	GC5	-	0
	GC6	-	0
	GC7	-	0

- = Compound not detected.

TABLE 8-23.

ORGANIC ANALYSIS

Ammonia liquor, pH 2

	TCO mg	GRAV mg	TCO + GRAV Total mg	Concentration mg/ (m^3, L, or kg)[5]
Total Sample[1]	8,720	6,560	15,280	19,100
Taken for LC[2]	46.7	50.3	97.0	
Recovered[3]				

Fraction	TCO in mg				GRAV in mg				TCO + GRAV Total mg	Concentration mg/ (m^3,L, or kg)[5]
	Found in Fraction	Blank	Corrected	Total[4]	Found in Fraction	Blank	Corrected	Total[4]		
1			7.3	730			17.5	1,750	2,480	3,100
2			34.6	3,460			8.8	880	4,340	5,425
3			1.4	140			6.8	680	820	1,025
4			2.1	210			2.6	260	470	588
5			0.7	70			0.0	0	70	88
6			18.6	1,860			5.0	500	2,360	2,950
7			0.0	0			0.8	80	80	100
Sum			64.7	6,470			41.5	4,150	10,620	13,276

1. Quantity in entire sample, determined before LC
2. Portion of whole sample used for LC, actual mg
3. Quantity recovered from LC column, actual mg
4. Total mg computed back to total sample
5. Supply values for both sample size and concentration

TABLE 8-24.

ORGANIC ANALYSIS

Ammonia liquor, pH 12

	TCO mg	GRAV mg	TCO + GRAV Total mg	Concentration mg/ (m^3, L, or kg)[5]
Total Sample[1]	2,000	1,156	3,156	3,945
Taken for LC[2]	25.6	27.7	53.3	
Recovered[3]				

Fraction	TCO in mg				GRAV in mg				TCO + GRAV Total mg	Concentration mg/ (m^3, L, or kg)[5]
	Found in Fraction	Blank	Corrected	Total[4]	Found in Fraction	Blank	Corrected	Total[4]		
1			0.0	0.0			2.75	137.5	137.5	171.9
2			2.1	105.0			0.4	20.0	125.0	156.2
3			3.5	175.0			1.2	60.0	235.0	293.8
4			1.0	50.0			1.2	60.0	110.0	137.5
5			0.0	0.0			0.0	0.0	0.0	0.0
6			26.4	1320.0			13.8	690.0	2010.0	2,512.5
7			0.0	0.0			1.0	50.0	50.0	62.5
Sum			33.0	1650.0			20.35	1017.5	2667.5	3,334.4

1. Quantity in entire sample, determined before LC
2. Portion of whole sample used for LC, actual mg
3. Quantity recovered from LC column, actual mg
4. Total mg computed back to total sample
5. Supply values for both sample size and concentration

TABLE 8-25.

ORGANIC ANALYSIS

Froth Flotation Separator, XAD-2 Resin

	TCO mg	GRAV mg	TCO + GRAV Total mg	Concentration mg/ (m^3, L, or kg)[5]
Total Sample[1]	18,538	40	18,578	6,213.4
Taken for LC[2]	52.7	1.6	54.3	
Recovered[3]				

Fraction	TCO in mg				GRAV in mg				TCO + GRAV Total mg	Concentration mg/ (m^3, L, or kg)[5]
	Found in Fraction	Blank	Corrected	Total[4]	Found in Fraction	Blank	Corrected	Total[4]		
1			0.0	0				0.0	0	0
2			48.0	12,000				0.0	12,000	4,013
3			0.8	200				0.0	200	67
4			0.1	25				0.0	25	8
5			4.8	1,200				0.0	1,200	401
6			0.0	0				0.0	0	0
7			0.0	0				0.0	0	0
Sum			53.7	13,425				0.0	13,425	4,489

1. Quantity in entire sample, determined before LC
2. Portion of whole sample used for LC, actual mg
3. Quantity recovered from LC column, actual mg
4. Total mg computed back to total sample
5. Supply values for both sample size and concentration

TABLE 8-26.

ORGANIC ANALYSIS

Froth Flotation Separator, Canister Rinse

	TCO mg	GRAV mg	TCO + GRAV Total mg	Concentration mg/ (m^3, L, or kg)[5]
Total Sample[1]	360	493	853	5,686.7
Taken for LC[2]	36.1	49.4	85.5	-
Recovered[3]				

Fraction	TCO in mg				GRAV in mg				TCO + GRAV Total mg	Concentration mg/ (m^3, L, or kg)[5]
	Found in Fraction	Blank	Corrected	Total[4]	Found in Fraction	Blank	Corrected	Total[4]		
1			0.0	0.0			11.5	23.4	23.4	156.0
2			1.0	2.0			7.4	15.1	17.1	114.0
3			0.2	0.4			7.2	14.7	15.1	100.7
4			0.0	0.0			2.4	4.9	4.9	32.7
5			0.0	0.0			1.8	3.7	3.7	24.7
6			0.7	1.4			11.4	23.2	24.6	164.0
7			0.0	0.0			2.6	5.3	5.3	35.3
Sum			1.9	3.8			44.3	90.3	94.1	627.4

1. Quantity in entire sample, determined before LC
2. Portion of whole sample used for LC, actual mg
3. Quantity recovered from LC column, actual mg
4. Total mg computed back to total sample
5. Supply values for both sample size and concentration

TABLE 8-27.

ORGANIC ANALYSIS

Final Cooler Cooling Tower, XAD-2 Resin

	TCO mg	GRAV mg	TCO + GRAV Total mg	Concentration mg/ (m^3, L, or kg)^5
Total Sample^1	6,066	60	60,126	1,817.8
Taken for LC^2	47	9.4	56.4	
Recovered^3				

Fraction	TCO in mg				GRAV in mg				TCO + GRAV Total mg	Concentration mg/ (m^3,L, or kg)^5
	Found in Fraction	Blank	Cor-rected	Total^4	Found in Fraction	Blank	Cor-rected	Total^4		
1			0.0	0.0			-0.2	0.0	0.0	0.0
2			34.0	1,020			0.0	0.0	1,020	302.9
3			0.7	21			-0.1	0.0	21	6.2
4			1.1	33			-0.1	2.0	33	9.8
5			0.9	27			-0.1	0.0	27	8.0
6			6.2	186			0.0	0.0	186	55.2
7			0.0	0.0			-0.1	0.0	0.0	0.0
Sum			42.9	1,287				0.0	1,287	381.9

1. Quantity in entire sample, determined before LC
2. Portion of whole sample used for LC, actual mg
3. Quantity recovered from LC column, actual mg
4. Total mg computed back to total sample
5. Supply values for both sample size and concentration

TABLE 8-28.

LC FRACTIONATION

SAMPLE: Final cooler cooling tower vapor, canister rinse

	TCO mg	GRAV mg	TCO + GRAV total mg	Concentration[a] mg/ (m^3, L, or kg)
Total Sample[b]	138	16.0	154.0	5.6
Taken for LC[c]	0.0	11.0	11.0	0.40
Recovered[d]				

Fraction	TCO[e] mg	GRAV[e] mg	TCO + GRAV total mg	Concentration[a] mg/ (m^3, L, or kg)
1				
2				
3				
4		(TCO + GRAV <15 mg, no LC)		
5				
6				
7				

[a] Quantity in entire sample, determined before LC.
[b] Portion of whole sample used for LC, actual mg.
[c] Quantity recovered from LC column, actual mg.
[d] Total mg computed back to total sample.
[e] Values supplied for both sample size and concentration.
[f] Not detectable.

TABLE 8-29.

ORGANIC ANALYSIS

Final cooler cooling tower, hot well, pH 2

	TCO mg	GRAV mg	TCO + GRAV Total mg	Concentration mg/ (m³, L, or kg)[5]
Total Sample[1]	2,160	192	2,352	2,940
Taken for LC[2]	73.2	18.1	91.3	
Recovered[3]				

Fraction	TCO in mg				GRAV in mg				TCO + GRAV Total mg	Concentration mg/ (m³,L, or kg)[5]
	Found in Fraction	Blank	Cor-rected	Total[4]	Found in Fraction	Blank	Cor-rected	Total[4]		
1			0.0	0.0			1.25	25.0	25.0	31.2
2			30.0	600.0			0.8	16.0	616.0	770.0
3			0.0	0.0			0.2	4.0	4.0	5.0
4			4.2	84.0			0.6	12.0	96.0	120.0
5			1.1	22.0			0.0	0.0	22.0	27.5
6			28.7	574.0			3.2	64.0	638.0	797.5
7			0.0	0.0			0.6	12.0	12.0	15.0
Sum			64.0	1280.0			6.65	133	1413.0	1766.2

1. Quantity in entire sample, determined before LC
2. Portion of whole sample used for LC, actual mg
3. Quantity recovered from LC column, actual mg
4. Total mg computed back to total sample
5. Supply values for both sample size and concentration

TABLE 8-30.

ORGANIC ANALYSIS

Final cooler cooling tower, hot well, pH 12

	TCO mg	GRAV mg	TCO + GRAV Total mg	Concentration mg/ (m^3, L, or kg)[5]
Total Sample[1]	720	80.0	800	1,000
Taken for LC[2]	66.0	25.8	91.8	
Recovered[3]				

Fraction	TCO in mg				GRAV in mg				TCO + GRAV Total mg	Concentration mg/ (m^3, L, or kg)[5]
	Found in Fraction	Blank	Corrected	Total[4]	Found in Fraction	Blank	Corrected	Total[4]		
1			0.0	0.0			0.0	0.0	0.0	0.0
2			2.9	29.0			0.0	0.0	29.0	36.3
3			0.0	0.0			0.2	2.0	2.0	2.5
4			2.6	26.0			0.6	6.0	32.0	40.0
5			1.0	10.0			0.0	0.0	10.0	12.5
6			41.7	417.0			14.6	146.0	563.0	703.8
7			0.0	0.0			0.0	0.0	0.0	0.0
Sum			48.2	482.0			15.4	154.0	636.0	795.1

1. Quantity in entire sample, determined before LC
2. Portion of whole sample used for LC, actual mg
3. Quantity recovered from LC column, actual mg
4. Total mg computed back to total sample
5. Supply values for both sample size and concentration

TABLE 8-31.

ORGANIC ANALYSIS

Final cooler cooling tower, cold well, pH 2

	TCO mg	GRAV mg	TCO + GRAV Total mg	Concentration mg/ (m^3, L, or kg)[5]
Total Sample[1]	1,360	160	1,520	1,900
Taken for LC[2]	43.1	17.4	61.0	
Recovered[3]				

Fraction	TCO in mg				GRAV in mg				TCO + GRAV Total mg	Concentration mg/ (m^3,L, or kg)[5]
	Found in Fraction	Blank	Corrected	Total[4]	Found in Fraction	Blank	Corrected	Total[4]		
1			0.0	0.0			0.75	15.0	15.0	18.8
2			10.2	204.0			0.0	0.0	204.0	255.0
3			0.0	0.0			0.4	8.0	8.0	10.0
4			1.2	24.0			0.4	8.0	32.0	40.0
5			3.4	68.0			0.6	12.0	80.0	100.0
6			28.1	562.0			6.2	124.0	686.0	857.5
7			0.0	0.0			0.2	4.0	4.0	5.0
Sum			42.9	858.0			8.55	171.0	1,029.0	1,286.3

1. Quantity in entire sample, determined before LC
2. Portion of whole sample used for LC, actual mg
3. Quantity recovered from LC column, actual mg
4. Total mg computed back to total sample
5. Supply values for both sample size and concentration

TABLE 8-32.

ORGANIC ANALYSIS

Final cooler cooling tower, cold well, pH 12

	TCO mg	GRAV mg	TCO + GRAV Total mg	Concentration mg/ (m^3, L, or kg)^5
Total Sample[1]	480	160	640	800
Taken for LC[2]	71.2	5.8	77.0	
Recovered[3]				

Fraction	TCO in mg				GRAV in mg				TCO + GRAV Total mg	Concentration mg/ (m^3,L, or kg)^5
	Found in Fraction	Blank	Corrected	Total[4]	Found in Fraction	Blank	Corrected	Total[4]		
1			0.0	0.0			0.0	0.0	0.0	0.0
2			0.1	0.5			0.0	0.0	0.5	0.6
3			0.0	0.0			0.2	1.0	1.0	1.3
4			1.5	7.5			0.6	3.0	10.5	13.1
5			0.9	4.5			0.2	1.0	5.5	6.9
6			47.8	239.0			5.0	25.0	264.0	330.0
7			0.0	0.0			0.0	0.0	0.0	0.0
Sum			50.3	251.5			6.0	30.0	281.5	351.9

1. Quantity in entire sample, determined before LC
2. Portion of whole sample used for LC, actual mg
3. Quantity recovered from LC column, actual mg
4. Total mg computed back to total sample
5. Supply values for both sample size and concentration

TABLE 8-33.

ORGANIC ANALYSIS

Vapor Above Tar Storage Tank, XAD-2 Resin

	TCO mg	GRAV mg	TCO + GRAV Total mg	Concentration mg/ (m^3, L, or kg)[5]
Total Sample[1]	6,620	100	6,720	2,030
Taken for LC[2]	60.9	25.4	86.3	
Recovered[3]				

Fraction	TCO in mg				GRAV in mg				TCO + GRAV Total mg	Concentration mg/ (m^3,L, or kg)[5]
	Found in Fraction	Blank	Corrected	Total[4]	Found in Fraction	Blank	Corrected	Total[4]		
1			1.8	180			0.0	0.0	180	54
2			42.0	4,200			0.2	20.0	4,220	1,275
3			3.5	350			0.0	0.0	350	106
4			8.0	80			0.2	20.0	100	30
5			4.0	40			0.4	40.0	80	24
6			45.0	450			0.0	0.0	450	136
7			0.0	0.0			0.3	60.0	60	18
Sum			53.0	5,300			1.1	140.0	5,440	1,643

1. Quantity in entire sample, determined before LC
2. Portion of whole sample used for LC, actual mg
3. Quantity recovered from LC column, actual mg
4. Total mg computed back to total sample
5. Supply values for both sample size and concentration

TABLE 8-34.

ORGANIC ANALYSIS

Vapor Above Tar Storage Tank, Canister Rinse

	TCO mg	GRAV mg	TCO + GRAV Total mg	Concentration mg/ (m^3, L, or kg)^5
Total Sample[1]	1,545	109 (spill)	1,654	11,027
Taken for LC[2]	97.1	6.8	103.9	
Recovered[3]				

Fraction	TCO in mg				GRAV in mg				TCO + GRAV Total mg	Concentration mg/ (m^3,L, or kg)^5
	Found in Fraction	Blank	Corrected	Total[4]	Found in Fraction	Blank	Corrected	Total[4]		
1			2.0	24.2			0.75	9.10	33.3	222
2			30.0	364			2.6	31.5	396	2,640
3			37.4	453			0.6	7.28	460	3,067
4			0.2	2.42			0.2	2.42	4.84	32.6
5			0.0	0.0			0.0	0.0	0.0	0
6			2.0	24.2			0.0	0.0	24.2	161
7			0.0	0.0			0.0	0.0	0.0	0.0
Sum			71.6	868			4.15	50.3	918	6,123

1. Quantity in entire sample, determined before LC
2. Portion of whole sample used for LC, actual mg
3. Quantity recovered from LC column, actual mg
4. Total mg computed back to total sample
5. Supply values for both sample size and concentration

TABLE 8-35.

ORGANIC ANALYSIS

Tar Decanter Vapor, XAD-2 Resin

	TCO mg	GRAV mg	TCO + GRAV Total mg	Concentration mg/ (m^3, L, or kg)[5]
Total Sample[1]	31,520	20,080	33,600	10,874
Taken for LC[2]	44.9	29.1	74.0	
Recovered[3]				

Fraction	TCO in mg				GRAV in mg				TCO + GRAV Total mg	Concentration mg/ (m^3, L, or kg)[5]
	Found in Fraction	Blank	Cor-rected	Total[4]	Found in Fraction	Blank	Cor-rected	Total[4]		
1			0.0	0.0			0.25	188	188	61
2			14.7	11,025			1.2	900	11,925	3,859
3			14.9	11,175			0.0	0.0	11,175	3,617
4			0.8	600			0.0	0.0	600	194
5			0.1	75			0.0	0.0	75	24
6			0.8	600			0.6	450	1,050	340
7			0.0	0.0			-0.2	0.0	0.0	0
Sum			31.3	23,475			205	1,538	25,013	8,095

1. Quantity in entire sample, determined before LC
2. Portion of whole sample used for LC, actual mg
3. Quantity recovered from LC column, actual mg
4. Total mg computed back to total sample
5. Supply values for both sample size and concentration

TABLE 8-36.
ORGANIC ANALYSIS
Tar Decanter Vapor, Canister Rinse

	TCO mg	GRAV mg	TCO + GRAV Total mg	Concentration mg/ (m^3, L, or kg)[5]
Total Sample[1]	8,190	1,760	9,950	47,381
Taken for LC[2]	85.5	18.4	103.9	
Recovered[3]				

Fraction	TCO in mg				GRAV in mg				TCO + GRAV Total mg	Concentration mg/ (m^3, L, or kg)[5]
	Found in Fraction	Blank	Corrected	Total[4]	Found in Fraction	Blank	Corrected	Total[4]		
1			0.0	0.0				62.5	62.5	298
2			88.3	5,520				2,390	7,910	37,667
3			1.0	62.3				25.0	87.3	416
4			0.0	0.0				12.5	12.5	59
5			0.0	0.0				37.5	37.5	178
6			5.1	319*				12.5	331.5	1,578
7			0.0	0.0				25.0	25.0	119
Sum			94.4	5,900				2,565	8,466	40,315

1. Quantity in entire sample, determined before LC
2. Portion of whole sample used for LC, actual mg
3. Quantity recovered from LC column, actual mg
4. Total mg computed back to total sample
5. Supply values for both sample size and concentration

TABLE 8-37.

ORGANIC ANALYSIS

Tar Decanter Vapor, Condensate Extract pH 2

	TCO mg	GRAV mg	TCO + GRAV Total mg	Concentration mg/ (m^3, L, or kg)[5]
Total Sample[1]	1,545	138	1,683	11,220
Taken for LC[2]	46.2	25.3	71.5	
Recovered[3]				

Fraction	TCO in mg				GRAV in mg				TCO + GRAV Total mg	Concentration mg/ (m^3, L, or kg)[5]
	Found in Fraction	Blank	Corrected	Total[4]	Found in Fraction	Blank	Corrected	Total[4]		
1			0.0	0.0			0.25	5.0	5.0	33.3
2			5.4	108			3.0	60	168	1,120
3			3.7	74			4.2	84	158	1,053
4			1.9	38			0.2	8.0	46	307
5			2.1	42			0.4	16	58	387
6			29.8	596			4.8	192	788	5,253
7			0.0	0.0			0.1	0.0	0.0	0.0
Sum			42.9	858			12.9	365	1,223	8,153

1. Quantity in entire sample, determined before LC
2. Portion of whole sample used for LC, actual mg
3. Quantity recovered from LC column, actual mg
4. Total mg computed back to total sample
5. Supply values for both sample size and concentration

TABLE 8-38.

ORGANIC ANALYSIS

Tar Decanter Vapor, Condensate Extract pH 12

	TCO mg	GRAV mg	TCO + GRAV Total mg	Concentration mg/ (m^3, L, or kg)^5
Total Sample^1	345	138	483	
Taken for LC^2	67.6	5.2	72.8	
Recovered^3				

Fraction	TCO in mg				GRAV in mg				TCO + GRAV Total mg	Concentration mg/ (m^3,L, or kg)^5
	Found in Fraction	Blank	Cor-rected	Total^4	Found in Fraction	Blank	Cor-rected	Total^4		
1			0.0	0.0			0.75	3.75	3.8	
2			1.3	6.5			0.0	0.0	6.5	
3			0.6	3.0			0.4	2.0	5.0	
4			0.1	3.5			0.0	0.0	3.5	
5			3.1	15.5			0.6	3.0	18.5	
6			41.5	207.5			2.0	110.0	218.0	
7			0.0	0.0			0.2	1.0	1.0	
Sum			47.2	2,360			3.95	19.8	255.8	

1. Quantity in entire sample, determined before LC
2. Portion of whole sample used for LC, actual mg
3. Quantity recovered from LC column, actual mg
4. Total mg computed back to total sample
5. Supply values for both sample size and concentration

TABLE 8-39.
ORGANIC ANALYSIS

Vapor Above Chemical Oil Tank, XAD-2 Resin

	TCO mg	GRAV mg	TCO + GRAV Total mg	Concentration mg/ (m^3, L, or kg)^5
Total Sample^1	26,730	3,360	30,090	9,345
Taken for LC^2	57.6	11.5	69.1	
Recovered^3				

Fraction	TCO in mg				GRAV in mg				TCO + GRAV Total mg	Concentration mg/ (m^3, L, or kg)^5
	Found in Fraction	Blank	Corrected	Total^4	Found in Fraction	Blank	Corrected	Total^4		
1			0.3	150.0			0.0	0.0	150	46.6
2			14.9	7,450.0			0.0	0.0	7,450	2,317.7
3			17.7	8,850.0			-0.2	0.0	8,850	2,748.4
4			0.0	0.0			-0.2	0.0	0	0.0
5			0.2	100.0			-0.1	0.0	100	31.0
6			6.0	3,000.0			0.0	0.0	3,000	931.7
7			0.0	0.0			-0.1	0.0	0	0.0
Sum			39.1	19,550.0			0.0	0.0	19,550	6,075.4

1. Quantity in entire sample, determined before LC
2. Portion of whole sample used for LC, actual mg
3. Quantity recovered from LC column, actual mg
4. Total mg computed back to total sample
5. Supply values for both sample size and concentration

TABLE 8-40.

ORGANIC ANALYSIS

Vapor Above Chemical Oil Tank, Canister Rinse

	TCO mg	GRAV mg	TCO + GRAV Total mg	Concentration mg/ (m^3, L, or kg)[5]
Total Sample[1]	2,480	8,960	11,440	57,200
Taken for LC[2]	19.6	70.8	90.4	
Recovered[3]				

Fraction	TCO in mg				GRAV in mg				TCO + GRAV Total mg	Concentration mg/ (m^3,L, or kg)[5]
	Found in Fraction	Blank	Cor-rected	Total[4]	Found in Fraction	Blank	Cor-rected	Total[4]		
1			15.3	3,740			0.5	122	3,862	19,310
2			65.6	16,000			27.0	6,610	22,610	113,050
3			17.4	4,260			0.0	0	4,260	21,300
4			0.0	0			3.0	734	734	3,670
5			0.0	0			0.0	0	0	0
6			4.2	1,030			0.0	0	1,030	5,150
7			0.0	0			0.0	0	0	0
Sum			102.5	25,030			27.5	7,466	32,496	162,480

1. Quantity in entire sample, determined before LC
2. Portion of whole sample used for LC, actual mg
3. Quantity recovered from LC column, actual mg
4. Total mg computed back to total sample
5. Supply values for both sample size and concentration

TABLE 8-41.
ORGANIC ANALYSIS
Upwind Ambient, XAD-2 Resin

	TCO mg	GRAV mg	TCO + GRAV Total mg	Concentration mg/ (m^3, L, or kg)^5
Total Sample[1]	100	40	140	140
Taken for LC[2]	24	11.5	35.5	
Recovered[3]				

Fraction	TCO in mg				GRAV in mg				TCO + GRAV Total mg	Concentration mg/ (m^3,L, or kg)^5
	Found in Fraction	Blank	Cor-rected	Total[4]	Found in Fraction	Blank	Cor-rected	Total[4]		
1			1.0	2.0			0.0	0.0	2.0	2.0
2			12.4	24.8			1.6	3.2	28.0	28.0
3			3.6	7.2			0.8	1.6	8.8	8.8
4			0.0	0.0			0.0	0.0	0.0	0.0
5			0.9	1.8			0.0	0.0	1.8	1.8
6			2.1	4.2			2.0	4.0	8.2	8.2
7			0.0	0.0			2.6	5.2	5.2	5.2
Sum			20.0	40.0			7.0	14.0	54.0	54.0

1. Quantity in entire sample, determined before LC
2. Portion of whole sample used for LC, actual mg
3. Quantity recovered from LC column, actual mg
4. Total mg computed back to total sample
5. Supply values for both sample size and concentration

TABLE 8-42.

LC FRACTIONATION

SAMPLE: Upwind ambient, canister rinse

	TCO mg	GRAV mg	TCO + GRAV total mg	Concentration[a] mg/ (m^3, L, or kg)*
Total Sample[b]	(----------------data not available----)			
Taken for LC[c]	(data not available)	6.7		0.24
Recovered[d]				

Fraction	TCO[e] mg	GRAV[e] mg	TCO + GRAV total mg	Concentration[a] mg/ (m^3, L, or kg)
1				
2				
3				
4		(TCO + GRAV <15 mg, No LC)		
5				
6				
7				

*Standard conditions of 20° C and 760 mmHg.

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[a] Quantity in entire sample, determined before LC.
[b] Portion of whole sample used for LC, actual mg.
[c] Quantity recovered from LC column, actual mg.
[d] Total mg computed back to total sample.
[e] Values supplied for both sample size and concentration.
[f] Not detectable.

TABLE 8-43.

LC FRACTIONATION

SAMPLE: Downwind ambient, XAD-2 resin

	TCO mg	GRAV mg	TCO + GRAV total mg	Concentration[a] mg/ (m^3, L, or kg) *
Total Sample[b]	0	60.0	60.0	2.2
Taken for LC[c]	3.0	33.5	36.15	1.3
Recovered[d]				

Fraction	TCO[e] mg	GRAV[e] mg	TCO + GRAV total mg	Concentration[a] mg/ (m^3, L, or kg)
1				
2				
3				
4	(TCO + GRAV	<15 mg, No LC)		
5				
6				
7				

*Standard conditions of 20° C and 760 mmHg.

[a] Quantity in entire sample, determined before LC.
[b] Portion of whole sample used for LC, actual mg.
[c] Quantity recovered from LC column, actual mg.
[d] Total mg computed back to total sample.
[e] Values supplied for both sample size and concentration.
[f] Not detectable.

TABLE 8-44.

LC FRACTIONATION

SAMPLE: Downwind ambient, canister rinse

	TCO mg	GRAV mg	TCO + GRAV total mg	Concentration[a] mg/ (m^3, L, or kg)*
Total Sample[b]	225.0	4.0	229.0	8.3
Taken for LC[c]		8.2		0.30
Recovered[d]				

Fraction	TCO[e] mg	GRAV[e] mg	TCO + GRAV total mg	Concentration[a] mg/ (m^3, L, or kg)
1				
2				
3				
4	(TCO + GRAV	<15 mg, No LC)		
5				
6				
7				

*Standard conditions of 20° C and 760 mmHg.

[a] Quantity in entire sample, determined before LC.
[b] Portion of whole sample used for LC, actual mg.
[c] Quantity recovered from LC column, actual mg.
[d] Total mg computed back to total sample.
[e] Values supplied for both sample size and concentration.
[f] Not detectable.

TABLE 8-45.

ORGANIC ANALYSIS

Biological Treatment Plant Sludge, pH 7 Extract

	TCO mg	GRAV mg	TCO + GRAV Total mg	Concentration mg/ (m³, L, or kg)[5]
Total Sample[1]	135	45	180	400
Taken for LC[2]	1.5	28	29.5	
Recovered[3]				

Fraction	TCO in mg				GRAV in mg				TCO + GRAV Total mg	Concentration mg/ (m³,L, or kg)[5]
	Found in Fraction	Blank	Cor-rected	Total[4]	Found in Fraction	Blank	Cor-rected	Total[4]		
1			0.0	0.0			8.0	16.0	16.0	35.6
2			0.0	0.0			1.8	3.6	3.6	8.0
3			0.0	0.0			2.2	4.4	4.4	9.8
4			0.0	0.0			0.8	1.6	1.6	3.6
5			0.0	0.0			0.2	0.4	0.4	0.9
6			0.0	0.0			10.4	20.8	20.8	46.2
7			0.0	0.0			1.2	2.4	2.4	5.3
Sum			0.0	0.0			24.6	49.2	49.2	109.4

1. Quantity in entire sample, determined before LC
2. Portion of whole sample used for LC, actual mg
3. Quantity recovered from LC column, actual mg
4. Total mg computed back to total sample
5. Supply values for both sample size and concentration

TABLE 8-46.
IR REPORT

SAMPLE: 8A-P, ammonia liquor, pH 2 extract: preliminary IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3590, 3470	w	free and dimeric OH stretch of phenols
3600-3000	w(broad)	alcohol or phenolic OH stretch (polymeric)
3040, 3000	w	aromatic CH stretch
2955, 2938,		
2850	s	aliphatic CH stretch
1660-1650	m	diaryl ketones, carboxylate ion, or aromatic or
		highly conj. carboxylic acid
1455, 1330	m,w	alkyl CH bend
845-800	w	sub. aromatic CH bend
1330	w	unassigned

OTHER REMARKS:

Spectrum indicates that sample is predominantly alkylated phenols or alkylated derivates of highly unsaturated or aromatic acids.

TABLE 8-47.
IR REPORT

SAMPLE: 8A-C, ammonia liquor, pH 2 extract: concentrate IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3418	w	alcoholic or phenolic OH
3055	m	aromatic C-H
2959, 2925,		
2856	s	aliphatic C-H
1650	m	β-diketone, diaryl ketone
1602	m	aromatic
1459	s	aromatic, methyl, methylene
1376	m	aromatic, methyl, methylene
814	m	aromatic, methyl, methylene
746	s	aromatic, C-Cl, aliphatic
1240	w	unassigned

OTHER REMARKS:

2363 and 2342 due to Co_2.
Sample appears to contain predominantly alkylated phenols.

TABLE 8-48.
IR REPORT

SAMPLE: 8A-LC1, ammonia liquor, pH 2 extract: LC cut #1 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
2959, 2932,		
2856	s	aliphatic C-H
1465, 1376	m	aliphatic CH bend
725	w	unassigned

OTHER REMARKS:

Probable saturated hydrocarbon, LRMS indicative of some PNAs as well as saturated chains.

TABLE 8-49.
IR REPORT

SAMPLE: 8A-LC2, ammonia liquor, pH 2 extract: LC cut #2 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3055	s	aromatic C-H, $-CH_2$-halogen
2959, 2925,		
2870	s	aliphatic C-H
1931	w	aromatic
1808	w	aromatic
1733	w	aromatic
1602	m	aromatic
1458	s	aliphatic CH bend
1376	m	methyl CH bend
1315	m	aromatic
1246	m	aromatic
1911	m	aromatic
1081, 1033,		
958	m	aromatic
833, 732	s	aromatic, C-Cl, aliphatic

OTHER REMARKS:

Probable mono-substituted alkyl aromatic.

TABLE 8-50.
IR REPORT

SAMPLE: 8A-LC3, ammonia liquor, pH 2 extract: LC cut #3 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3055	s	aromatic C-H, $-CH_2$-halogen
2925	w	aliphatic C-H
1650	w	unsaturated aromatic
1602	m	aromatic
1452	s	aromatic
1191	m	aromatic
883	m	aromatic
842	s	aromatic
815	s	aromatic
773	s	aromatic
746	s	aromatic
1924, 1801	w	unassigned

OTHER REMARKS:

PNA hydrocarbons; confirmed by LRMS

TABLE 8-51.
IR REPORT

SAMPLE: 8A-LC4, ammonia liquor, pH 2 extract: LC cut #4 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3425	m	alcoholic or phenolic OH
3055	w	aromatic C-H
1650	w	β-diketone unsaturated C-H carboxylic acid, diaryl
		ketone
1452	s	aliphatic C-H
1328	m	aliphatic C-H, phenol, acid
1239	m	aliphatic C-H, phenol, acid or alcohol
746	s	CH_3, C-Cl, aromatic
725	s	CH_3, C-Cl, aromatic

OTHER REMARKS:

2390, 2370, due to CO_2.

TABLE 8-52.
IR REPORT

SAMPLE: 8A-LC5, ammonia liquor, pH 2 extract: LC cut #5 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3384	m	OH
3055	m	aromatic C-H
2932	s	aliphatic C-H
2856	m	aliphatic C-H
1719	w	ketone, ester
1602	m	aromatic
1458	s	aromatic
1376	m	aromatic
1273	m	CH_3-
821	m	
746	s	phenyl, C-Cl, aliphatic
2226, 1917	w	unassigned

OTHER REMARKS:

This sample possessed less mass than that required by the Level 1 criteria for IR analysis. A spectrum of acceptable quality was obtained by using Fourier Transform IR techniques.

Substituted phenol probable. Bands at 2363 cm^{-1} and 2239 cm^{-1} due to CO_2.

TABLE 8-53.
IR REPORT

SAMPLE: 8A-LC6, ammonia liquor, pH 2 extract: LC cut #6 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3280	s	aromatic C-H
3199	s	aromatic C-H
3055	s	aromatic C-H
2925	s	aliphatic C-H
2863	m	aliphatic C-H
1650	s	β-diketone, carboxylate, diaryl ketone
1596	s	substituted phenyl
1459	s	substituted phenyl
1280	s	ester, ether
835	m	aromatic C-H
752	s	C-Cl, aromatic C-H, aliphatic
2226	w	unassigned

OTHER REMARKS:

LRMS supports aromatic nature of compounds responsible for this spectrum. Probably heterocyclic amines.

TABLE 8-54.
IR REPORT

SAMPLE: 8A-LC7, ammonia liquor, pH 2 extract: LC cut #7 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
2970	s	aliphatic C-H (stretching)
2925	s	aliphatic C-H (stretching)
2875	m	aliphatic C-H (stretching)
1740	s	ester or aliphatic ketone
1431	m	aliphatic C-H (bending)
1376	m	aliphatic C-H (bending)
1239	s	ester C-O
1123	m	ester C-O
1082	m	ester C-O
1027	m	ester C-O
739	m	C-Cl, aromatic C-H, aliphatic
698	m	C-Cl, aromatic C-H, aliphatic
616	m	C-Cl, aromatic C-H, aliphatic

OTHER REMARKS:

Probable ester.

TABLE 8-55.
IR REPORT

SAMPLE: 8B-P, ammonia liquor, pH 12 extract: preliminary IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3500-3150	Broad	unresolved band due to NH stretch of amines and
		anides
3090, 3020	m	aromatic or olefinic CH stretch
2920, 2918,		
2860	m	diphatic CH stretch
1725	s	ester or diphatic ketone
1650	s	amide I band
1615-1590	s (broad)	substituted aromatic C-C or NH bend of 1° amine
1370	w	aliphatic CH bend
1240, 1120	s	ester of aromatic acid, CN stretch of amines or
		anides, alcohol or aromatic ether
690, 640	m	substituted aromatic CH bend
920	w	unassigned

OTHER REMARKS:

Sample appears to be predominantly aliphatic amides and ketones, but only some substituted benzene compounds.

TABLE 8-56.
IR REPORT

SAMPLE: 8B-C, ammonia liquor, pH 12 extract: concentrate IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3600		"Free" OH of alcohol or phenol
3500-2900	(broad)	OH and/or NH stretch of alcohols, amines, and anides
3030, 3000		aromatic or olefinic CH stretch
2955, 2930, 2875, 2850		diphatic CH stretch
1725		ester or aliphatic ketone
1660		amide I band
1595, 1500		aromatic C-C and amino NH bend
1470, 1385		aliphatic CH bend
1250-1080		CH stretch for amines and anides, C-O stretch of alcohol, C-C-O stretch of aromatic esters, or C-O-C stretch of ethers
840-730	(broad)	amine and anide NH bend
810		substituted aromatic CH bend
1510, 1340, 1000, 950	w	unassigned

OTHER REMARKS:

Bands at 1610, 1605, 1595, and 1510 cm^{-1} probably arising from NH stretching of 1° and 2° amides and amines.

Sample predominantly aromatic and aliphatic amines and amides, but also containing some alcohols aliphatic ketones, esters of aromatic acids, and/or aromatic or aliphatic ethers.

TABLE 8-57.
IR REPORT

SAMPLE: 8B-LC1, ammonia liquor, pH 12 extract: LC cut #1 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
2960, 2926, 2852	s	alkane
1462, 1377, 1281	m	alkane
1037	m	alkane
1735	w	unassigned

OTHER REMARKS:

This sample possessed less mass than that required by the Level 1 criteria for IR analysis. A spectrum of acceptable quality was obtained by using Fourier Transform IR techniques.

Sample consisted of saturated hydrocarbons and saturated ethers.

TABLE 8-58.
IR REPORT

SAMPLE: 8B-LC2, ammonia liquor, pH 12 extract: LC cut #2 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3055	m	aromatic C-H, -CH_2-halogen
2959, 2925, 2856	s	aliphatic C-H
1452	m	aromatic, aliphatic
1376	w	aliphatic
833, 842, 815, 773	m	aliphatic
732	s	aliphatic, C-Cl, aliphatic
1938, 1726	w	unassigned

OTHER REMARKS:

This sample possessed less mass than that required by the Level 1 criteria for IR analysis. A spectrum of acceptable quality was obtained by using Fourier Transform IR techniques.

2362 and 2342 due to CO_2. Probably PNA hydrocarbon. Sample contains alkylated aromatic hydrocarbons.

TABLE 8-59.
IR REPORT

SAMPLE: 8B-LC3, ammonia liquor, pH 12 extract: LC cut #3 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3053	w	aromatic C-H, $-CH_2$-halogen
2926, 2853	s	aliphatic C-H
1728	w	ester or aliphatic ketone
1668	w	alkene
1456	m	aromatic, methyl, methylene
1238	w	ester, ether
815	m	aromatic, C-Cl
749	m	aromatic, C-Cl
1377, 881, 640	w	unassigned

OTHER REMARKS:

This sample possessed less mass than that required by the Level 1 criteria for IR analysis. A spectrum of acceptable quality was obtained by using Fourier Transform IR techniques.

2363 and 2339 due to CO_2. Specific PNA's identified by LRMS.

TABLE 8-60.
IR REPORT

SAMPLE: 8B-LC4, ammonia liquor, pH 12 extract: LC cut #4 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3459	m	OH/NH
3062	m	aromatic C-H,-CH$_2$-halogen
2973, 2918	s	aliphatic C-H
2856	m	aliphatic C-H
1725	w	ester, ketone
1602	w	aromatic
1431, 1335	s	aromatic, methyl
1239	s	ester, ether, amine
1095	m	aromatic
965	m	aromatic
746, 615	s	aromatic, C-Cl, aliphatic
1198, 698	w	unassigned

OTHER REMARKS:

This sample possessed less mass than that required by the Level 1 criteria for IR analysis. A spectrum of acceptable quality was obtained by using Fourier Transform IR techniques.

Probable aromatic amine or alcohol. LRMS more consistent with amines.

TABLE 8-61.
IR REPORT

SAMPLE: 8B-LC5, ammonia liquor, pH 12 extract: LC cut #5 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3600-3200	w(broad)	alcohol or phenolic OH
2959, 2932,		
2856	s	aliphatic CH stretch
1733	m	ester or aliphatic ketone
1602	w	aromatic C-C
1459, 1438	m	aliphatic CH bend, aromatic
1249, 1102	m	ester or aromatic acid, alcohol, ether
746, 698	w	substituted aromatic CH bend
972, 855	w	unassigned

OTHER REMARKS:

This sample possessed less mass than that required by the Level 1 criteria for IR analysis. A spectrum of acceptable quality was obtained by using Fourier Transform IR techniques.

Probable alcohols and esters of aromatic acids.

TABLE 8-62.
IR REPORT

SAMPLE: 8B-LC5, ammonia liquor, pH 12 extract: LC cut #5 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
2959, 2932,		
2856	s	aliphatic C-H
1733	m	ketone/ester
1602	w	
1459, 1328	m	$-CH_2-$
1438, 1246	s	alkane
1328, 1102	m	alkane
972	m	aromatic figerpoint
835	w	aromatic
746	w	aromatic
698	w	unassigned

OTHER REMARKS:

TABLE 8-63.
IR REPORT

SAMPLE: 8B-LC6, ammonia liquor, pH 12 extract: LC cut #6 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3343, 3144	m	OH, NH
3062	s	aromatic C-H
2932	s	aliphatic C-H
2863	m	aliphatic C-H
2713, 2610	m	H-bonded OH, NH
1733	m	ketone, ester
1595	s	aromatic, $C\overset{\cdots}{-}C$
1507, 1472	s	aromatic, methyl, methylene
1376	m	methyl CH bend
1239	s	ester, ether, CH stretch of aromatic amine
787	s	

OTHER REMARKS:

Sample predominantly aromatic amines, esters of aromatic acids, or diphatic or aromatic ethers.

TABLE 8-64.
IR REPORT

SAMPLE: 8B-LC7, ammonia liquor, pH 12 extract: LC cut #7 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
2932	s	aliphatic C-H
2856	m	aliphatic C-H
1733	s	ketone, ester
1616	m	aromatic $\mathrm{C}\overset{\cdots}{-}\mathrm{C}$
1459	m	aromatic, methyl, methylene
1383	m	methyl CH bend
1246	m	ester, ether
1171	m	ester, ether
746	w	aromatic, C-Cl, diphatic
3596	w (broad)	unassigned

OTHER REMARKS:

Probable ester.

TABLE 8-65.
IR REPORT

SAMPLE: Froth flotation separator: XAD-2 resin, preliminary IR analysis

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3054	w	aromatic or olefinic CH stretch
2956, 2926, 2854	s	aliphatic CH stretch
1723	m	ketone or ester
1601	m	conj. olefine and/or aromatic $C\overset{\cdots}{-}C$
1495	w	aromatic $C\overset{\cdots}{-}C$
1454	w	aliphatic CH bend
1262, 1069	w	aromatic ester Ø-CO-O stretch
78	m	substituted aromatic compds
1713, 1693, 1182, 1022, 824	w	unassigned

OTHER REMARKS:

This sample possesses less mass than that required by Level 1 criteria for IR analysis. A spectrum of acceptable quality was obtained, however, since Fourier Transform IR techniques were utilized.

Sample appeared to contain principally aliphatic and aromatic ketones and esters. Also, large peak at 1602 cm^{-1} indicates significant amounts of conjugated olefins.

TABLE 8-66.

IR REPORT

SAMPLE: Froth flotation separator, XAD-2 resin, IR on concentrate

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3072, 3054, 3007	w	aromatic and olefinic CH
1956-1674	w	aromatic overtones/combinations
1592, 1387	w,m	α-substituted naphthalene, or
		conjugated vinyl C$\cdots$C stretch
1269-1005	w	aromatic fingerprint region
958	m	vinyl CH bend, or aromatic in-plane bend
782-700	s-m	substituted aromatic compds
1504, 847, 618	w	unassigned

OTHER REMARKS:

Sample contains substituted aromatic and/or unsat. hydrocarbons. Large band at 782 cm^{-1} suggests that sample is predominantly naphthalene, i.e., band at 782 cm^{-1} is the resultant of CH out-of-plane bending of 4 adj. aromatic H.

TABLE 8-67.
IR REPORT

SAMPLE: Froth flotation separator, XAD-2 resin, LC cut #1 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
2954, 2932, 2856	s	aliphatic CH stretch
1740	m	ester or aliphatic ketone
1459	m	
1438, 1376	w	aliphatic CH bend

OTHER REMARKS:

TABLE 8-68.
IR REPORT

SAMPLE: Froth flotation separator, XAD-2 resin, LC cut #2 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
2958, 2927,	s	aliphatic CH stretch
2857		
1741	w	ester
1464, 1378	m,w	aliphatic CH bend
1261	s	ester of aromatic or α,β-unsaturated acids
1078, 1041	s	aliphatic ethers, or esters
863, 749, 702	w	substituted aromatic
802	s	substituted aromatic--predominantly α-substituted
		naphthalene or m-sub. benzene
1613, 1604	w	unassigned

OTHER REMARKS:

This sample possessed less mass than that required by Level 1 criteria for IR analysis. A spectrum of acceptable quality was obtained by using Fourier Transform IR techniques.

Sample predominantly esters of aromatic and/or α,β-unsaturated acids and/or aromatic and aliphatic ethers.

TABLE 8-69.
IR REPORT

SAMPLE: Froth flotation separator, XAD-2 resin, LC cut #3 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
2955-2854	s	aliphatic CH stretch
1745-1730	w	ester or aliphatic ketone
1465, 1381	w	aliphatic CH bend
1262, 1162,	w	aromatic ester or ether,
1080		aliphatic ether
801, 719	w	sub. aromatic compds
1481, 1038, 668	w	unassigned

OTHER REMARKS:

This sample possessed less mass than that required by the Level 1 criteria for IR analysis. A spectrum of acceptable quality was obtained by using Fourier Transform IR techniques. Spectrum includes peaks of I∿Intensity of blanks. Sample appears to contain only aliphatic esters of aromatic acids, or aliphatic ketones.

TABLE 8-70.
IR REPORT

SAMPLE: Froth flotation separator, XAD-2 resin, LC cut #4 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
2955-2854	s	aliphatic CH stretch
1756-1715	w	ketone or ester
1462,1453	w	aliphatic CH bend
1380,1368	w	gem, -dimethyl bend
746	w	sub benzene
1271,1163,1072	w	unassigned

OTHER REMARKS:

This sample possessed less mass than that required by the Level 1 criteria for IR analysis. A spectrum of acceptable quality was obtained by using Fourier Transform IR techniques.

Spectrum appears to contain predominantly alkylated aromatic hydrocarbons and aliphatic ketones or esters of aromatic acids.

TABLE 8-71.
IR REPORT

SAMPLE: Froth flotation separator, XAD-2 resin, LC cut #5 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3350	broad	alcohol or phenol OH
3062	w	aromatic CH stretch
2959,2932,2856	s	aliphatic CH stretch
1726	m	aliphatic ketone, or ester
1602	m	aromatic $\mathrm{C}\overset{\cdots}{-\!-}\mathrm{C}$
1465,1376	m,w	aliphatic CH bend
1287,1253	m	ester of aromatic acid, or alcoholic or
		phenolic C-O
1123,1075	w	ester of 10 and/or 20 alc.
753,698	w	mono-sub. benzene
1513,1493,1027	w	unassigned

OTHER REMARKS:

Sample contains primarily sat. hydrocarbons, aliphatic esters of aromatic acids, predominantly benzoates, and alcohols or phenols.

TABLE 8-72.
IR REPORT

SAMPLE: Froth flotation separator, XAD-2 resin, LC cut #6 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
2956,2927,2854	s	aliphatic CH stretch
1729	s	ketone or ester
1452	w	aliphatic CH bend
1380,1371	w	geminal-dimethyl CH bend
758,743	w	substituted aromatic
1258,1244	w	ester or aromatic acid, or aromatic and/or
		aliphatic ethers
1077,1032	m	
1601,1464	w	unassigned

OTHER REMARKS:

This sample possessed less mass than that required by the Level 1 criteria for IR analysis. A spectrum of acceptable quality was obtained by using Fourier Transform IR techniques.

Sample contains predominantly alkylated aromatic esters and/or ethers.

TABLE 8-73.
IR REPORT

SAMPLE: Froth flotation separator, XAD-2 resin, LC cut #7 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
2962,2930,2854	s	aliphatic CH
1744,1732	s	aliphatic ketone, or ester
1451,1380	w	aliphatic CH bend
1258,1076,1032		acetates or primary or secondary alcohols,
		or aromatic ethers
758,743,723	w	sub. aromatic compds
3367,3091,1604,	w	unassigned
1553,1121		

OTHER REMARKS:

This sample possessed less mass than that required by the Level 1 criteria for IR analysis. A spectrum of acceptable quality was obtained by using Fourier Transform IR techniques.

Sample appears to contain predominantly aliphatic esters (acetates), cyclic saturated ketones, and some aromatic material.

TABLE 8-74.
IR REPORT

SAMPLE: 1XR-P, froth flotation separator, canister rinse: preliminary IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3050	w	aromatic CH stretch
2970,2925,2848	w	aliphatic CH stretch
1720,1712	w	aliphatic ketone and esters
1640,1595	w	aromatic C$\overset{\cdots}{-}$C
1440,1420,1375	m,m,w	aliphatic CH bend
1265	s	ester of α,β-unsat. or aromatic acid
		or aromatic ester
1140-1125	w	aromatic and/or aliphatic ethers
		or aromatic esters
890	w	substituted aromatic cmpds.
860-700	w	substituted aromatic compds
700-650	w	substituted aromatic cmpds.
2550,2540,2400,	w	unassigned
1070-970		

OTHER REMARKS:

Sample contains predominantly unsat. and/or aromatic ethers and esters of aromatic acids or aromatic ethers. Bands at 1712, 1440, and 1420 cm^{-1} suggest that aliphatic ketones or esters of saturated acids are present:{-CH_2-(C=O)-absorbs at 1420} spectrum dominated by band at 1265 cm^{-1} suggesting sample predominantly aromatic ethers.

TABLE 8-75.
IR REPORT

SAMPLE: 1XR-C, froth flotation separator, canister rinse: concentrate IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3043, 3007	w	aromatic or olefinic CH
2959, 2946, 2856	s	aliphatic CH
1737	m	ester or aliphatic ketone
2061, 1936	w	aromatic overtones/combinations
1598	m	aromatic $C\overset{\cdots}{-}C$
1452, 1380	m,w	aliphatic CH bend
1259	m	ester of aromatic or α,β-unsat. acid
1096, 1023	m,w	ester, aliphatic ether
842, 812, 751	w,w,m	sub. aromatic cmpds
2366, 878	w	unassigned

OTHER REMARKS:

This sample possessed less mass than that required by the Level 1 criteria for IR analysis. A spectrum of acceptable quality was obtained by using Fourier Transform IR techniques.

Sample appears to contain primarily esters of aromatic or α,β-unsat. acids and 1° and/or 2° alcohols. Peak at 1598 cm^{-1} due to org. nitrates or substituted aromatic cmpds. which occasionally show a large, broad unresolved peak in this region.

TABLE 8-76.
IR REPORT

SAMPLE: 1XR-LC1, froth flotation separator, canister rinse: LC cut #1 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
2959, 2931, 2856	s	aliphatic, CH stretch
1465	m	aliphatic, CH bend
1376	w	isolated methyl, CH bend
718	w	$-(CH_2)_4-$rocking
1739, 670	w	unassigned

OTHER REMARKS:

Sample predominantly sat. hydrocarbons, containing a trace of ketone.

TABLE 8-77.
IR REPORT

SAMPLE: 1XR-LC2, froth flotation separator, canister rinse; LC cut #2 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3048	m	aromatic C-H
2925, 2852	m	aliphatic C-H
1602	m	aromatic
1452	m	aromatic, methyl
842-705	s	aromatic aliphatic
1925, 1301, 1246, 1185, 1136, 1034	w	unassigned

OTHER REMARKS:

High concentration of aromatic material.

TABLE 8-78.
IR REPORT

SAMPLE: 1XR-LC3, froth flotation separator, canister rinse: LC cut #3 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3052	s	aromatic or olefinic CH
2957, 2926, 2857		aliphatic CH
1927, 1000, 1780		aromatic combinations and overtones
1599		aromatic or olefinic C-C
1456, 1440		aliphatic CH
1382		methyl CH
1195-1025		fingerprint region-aromatics
880, 843, 811, 744, 748	s	substituted aromatic cmpds
1731, 949, 711 690	w	unassigned

OTHER REMARKS:

Sample contains significant amounts of aromatic hydrocarbons.

TABLE 8-79.
IR REPORT

SAMPLE: 1XR-LC4, froth flotation separator, canister rinse: LC cut #4 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3502	s	2° amine
3055	m	aromatic or olefinic CH stretch
2959, 2925, 2856	s	aliphatic CH stretch
1925-1712	w	aromatic combination/overtones
1602	m	aromatic or olefinic C$\overset{\cdots}{-}$C
1459, 1451	s	aliphatic CH bend
1376	w	methyl CH bend
1263-1017	m-w	fingerprint region aromatic
804, 746, 725	m-s	substituted aromatic cmpds.
2226, 1492, 1326 867, 842, 700, 616, 566	w	unassigned

OTHER REMARKS:

Probable alkylated aromatic amines.

TABLE 8-80.
IR REPORT

SAMPLE: 1XR-LC5, froth flotation separator, canister rinse: LC cut #5 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3357	w (broad)	alcoholic or phenolic OH or amine
3055	w	aromatic CH
2959, 2932, 2856	s	aliphatic CH
2226, 2075	w	conjugated C≡N, or unsymmetric
		disub. acetylenic -C≡C-
1733	m	ester or aliphatic ketone
1602	m	aromatic $C\overset{\cdots}{-}C$
1458, 1376	m,w	aliphatic CH bend
1260	m	phenolic C-O aromatic ether, ester or aromatic amine
1095, 1027	m	ester, alcohol, phenol, 2° aromatic amine
801, 753	m,w	substituted aromatic CH bend
1177, 876, 690	w	unassigned

OTHER REMARKS:

Shape peak at 1260 possibly due to Ø-NH-R absorption.

Sample predominantly alkylated phenols or secondary aromatic amines, or aromatic esters.

TABLE 8-81.
IR REPORT

SAMPLE: 1XR-LC6, froth flotation separator, canister rinse: LC cut #6 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3062	w	aromatic CH stretch
2959, 2932, 2856	s	aliphatic CH stretch
2062	m	ketene or ketenimine, or keazoketone
1740	m	ketene, ester or aliphatic ketone
1650	m	aliphatic diazoketone
1602	m	aromatic C$\overset{\cdots}{-}$C
1452, 1376	m	aliphatic CH
1267-1177	m	aliphatic or aromatic C-O
828, 752	w,m	substituted aromatic
1109, 1020, 704	w	unassigned

OTHER REMARKS:

Sample predominantly aromatic and saturated and/or unsaturated hydrocarbons but does appear to contain some aliphatic esters and aliphatic diazoketones.

TABLE 8-82.
IR REPORT

SAMPLE: 1XR-LC7, froth flotation separator, canister rinse: LC cut #7 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3055	w	aromatic CH stretch
2959, 2932, 2856	s	aliphatic CH stretch
2062	s	ketene or ketenimine (C=C=O) (>C=C=N-)
1746	m	ketene, ester or aliphatic ketone
1465, 1383	m,w	aliphatic CH bend
1074	m	aromatic ester ethyl or n-propyl C-C
821, 753	w	substituted aromatic or ethyl or n-propyl C-C
1644, 1609, 1348,		
1314, 1178, 952,		
691	w	unassigned

OTHER REMARKS:

Band at 3261^{-1} believed to be due to presence of H_2O in IR cell.

No strong bands in region 1300-1000 cm^{-1} except at 1074 cm-1 suggest that absorption at 1746 cm^{-1} due to ester of saturated acid.

Sample predominantly saturated esters, ketenes, or ketenimines.

TABLE 8-83.
IR REPORT

SAMPLE: 2X-P, final cooler cooling tower vapor, XAD-2 resin: preliminary IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3034	w	aromatic or olefinic CH
2966, 2932,		
2875, 2864	s	aliphatic CH stretch
1723	s	ketone or ester
1604, 1491	m, w	aromatic or olefinic C$\overset{\cdots}{-}$C
1456, 1377	m, w	aliphatic CH
1269, 1110,		
1076	m, s, m	ester or aromatic acid, or aromatic and/or
		aliphatic ethers
798, 753, 702	w, w, m	sub. aromatic cmpds.-2 and 5 adj. hydrogens
1025	w	unassigned

OTHER REMARKS:

Sample contains predominantly aromatic and aliphatic esters and/or ethers. Bands in aromatic CH out-of-plane region suggest monosubstituted and p-disubstituted benzenes are predominant.

TABLE 8-84.
IR REPORT

SAMPLE: 2X-C, final cooler cooling tower vapor, XAD-2 resin: concentrate IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3094, 3053, 3006	w,m,w	aromatic or olefinic CH stretch
2965, 2934, 2865	w	aliphatic CH stretch
1674-1955	w	aromatic overtones/combinations
1597, 1426	m	condensed aromatic $C \overset{\cdots}{-} C$, α-sub. naphthalenes, conj. vinyl
781-699	s-m	substituted aromatic cmpds.
957	m	vinyl CH out-of-plane bend or aromatic in-plane bend
1568, 1509, 1456, 1391, 1274, 1245	w	unassigned

OTHER REMARKS:

Sample contains predominantly aromatic hydrocarbons. Bands at 1597, 1426, and 781 cm^{-1} highly suggestive of α-substituted naphthyl derivatives. Some saturated hydrocarbons are present as evidenced by weak bands at 2965-2865 cm^{-1}. Strong band at 950 cm^{-1} characteristic of conjugated vinyl group.

TABLE 8-85.
IR REPORT

SAMPLE: 2X-LC1, final cooler cooling tower vapor, XAD-2 resin: LC cut #1 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
2961, 2972, 2859	s	aliphatic CH stretch
1460, 1375	m,w	aliphatic CH bend

OTHER REMARKS:

This sample possessed less mass than that required by the Level 1 criteria for IR analysis. A spectrum of acceptable quality was obtained by using Fourier Transfor IR Techniques.

Sample contains only saturated hydrocarbons.

TABLE 8-86.
IR REPORT

SAMPLE: 2X-LC2, final cooler cooling tower vapor, XAD-2 resin: LC cut #2 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3062, 3024, 3006	w	aromatic or olefinic CH
2962, 2924, 2871	s	aliphatic CH stretch
1604, 1514, 1494	w	aromatic CH bend
1455, 1375	m,w	aliphatic CH bend
800, 755, 735, 699	w,w,w,	substituted aromatic cmpds predominantly mono-sub. benzene
1261, 1089, 1029, 886, 868	w	unassigned

OTHER REMARKS:

Sample predominantly saturated hydrocarbons containing some substituted aromatic cmpds.

TABLE 8-87.
IR REPORT

SAMPLE: 2X-LC3, final cooler cooling tower vapor, XAD-2 resin: LC cut #3 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3030	w	aromatic or olefinic CH
2965, 2930, 2859	s	aliphatic CH stretch
1738	w	ketone or ester
1456, 1380	m	aliphatic CH bend
1263, 1151, 1028	w	ester of aromatic acid, aromatic ether, aliphatic
		ether
799, 775, 751, 699	w,w,w,m	substituted aromatic CH bend
1603, 1492, 893	w	unassigned

OTHER REMARKS:
Sample predominantly saturated and aromatic hydrocarbons, with some aromatic and aliphatic esters and/or aromatic and aliphatic ethers present.

TABLE 8-88.
IR REPORT

SAMPLE: 2X-LC4, final cooler cooling tower vapor, XAD-2 resin: LC cut #4 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
2959, 2929,		
2859	s	aliphatic CH stretch
1738	m	ketone or ester
1462, 1380	m	aliphatic CH bend
1268, 1116,		
1028	m, w, w	ester of aromatic acid (Ø-CO-O) aliphatic or
		aromatic ether (C-O-C)
799, 752, 711		substituted aromatic cmpds.
1661, 1603,		
1069	w	unassigned

OTHER REMARKS:

Sample predominantly aliphatic and aromatic hydrocarbons, containing some esters of aromatic acids, and/or aromatic or aliphatic ethers.

TABLE 8-89.
IR REPORT

SAMPLE: 2X-LC5, final cooler cooling tower vapor, XAD-2 resin: LC cut #5 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
2959, 2930, 2859	s	aliphatic CH stretch
1732	s	ester or aliphatic ketone
1603	w	aromatic or olefinic $C \overset{\cdots}{-} C$
1462, 1380	m,w	aliphatic CH bend
1280, 1128	s,m	aliphatic ester of aromatic acid, aromatic or aliphatic ether
740, 711	w	substituted aromatic
1075	w	unassigned

OTHER REMARKS:

This sample possessed less mass than that required by the Level 1 criteria for IR analysis. A spectrum of acceptable quality was obtained by using Fourier Transform IR techniques.

Sample appears to contain predominantly aliphatic esters of aromatic acids and/or aromatic or aliphatic ethers.

TABLE 8-90.
IR REPORT

SAMPLE: 2X-LC6, final cooler cooling tower vapor, XAD-2 resin: LC cut #6 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3063	w	aromatic or olefinic CH
2959, 2930, 2859	s	aliphatic CH stretch
1726	s	ester or aliphatic ketone
1603	m	aromatic or olefinic $C\overset{\cdots}{-}C$
1462, 1380	m,w	aliphatic CH
1274, 1116	m,m	ester of aromatic or α,β-unsaturated acids
752, 711, 693	m-w	substituted aromatic cmpds
1497	w	unassigned

OTHER REMARKS:

Sample predominantly esters of aromatic or α,β-unsaturated acids and primary alcohols.

TABLE 8-91.
IR REPORT

SAMPLE: 2X-LC7, final cooler cooling tower vapor, XAD-2 resin: LC cut #7 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
2953, 2930, 2859	s	aliphatic CH stretch
1726	m	ester of aliphatic ketone
1603	m	aromatic of olefinic $C\overset{\cdot\cdot}{-}C$
1450, 1374	m	aliphatic CH bend
1274, 1045	m	ester of aromatic or α,β-unsat. acid
1110	s	aliphatic ether
722	w	sub. aromatic, predominantly 4 adj. H
3323, 3096, 1668, 1556, 940	w	unassigned

OTHER REMARKS:

Sample contains predominantly aliphatic ethers with evidence of esters of aromatic or α,β-unsaturated acids.

TABLE 8-92.
IR REPORT

SAMPLE: 2XR-P, final cooler cooling tower vapor, canister rinse: preliminary IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3060	w	aromatic or olefinic CH
2963, 2927, 2862	s	aliphatic CH
1733	s	ester or aliphatic ketone
1603	m	aromatic C--C
1461, 1378	s,m	aliphatic CH
1414	m	α-naphthalene, aliphatic CH
1260	s	aromatic and aliphatic ethers and esters
1088 and 1023	s	aromatic fingerprint region
805, 864, 698	m	substituted aromatic CH bend
2064, 1946	w	unassigned

OTHER REMARKS:

Bands at 2363-2340 cm^{-1} are due to presence of CO_2 in cell.
Probable aliphatic esters of aromatic acids, and alkylated aromatic hydrocarbons.

TABLE 8-93.
IR REPORT

SAMPLE: 2XR-C, final cooler cooling tower vapor, canister rinse: concentrate IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3070	w	aromatic or olefinic CH
2966-2856	s	aliphatic CH
1740	m	aliphatic ketone or ester
1667	m	aromatic ketone or olefinic C=C
1600	w	aromatic or conj. olefinic C=C
1465	s	aliphatic (methylene) or aromatic C-C
1410	m	α-naphthalene, olefine, or paraffin
1380	m	methyl and α-naphthalene
1264	s	aromatic ethers, or esters
1093-1020	s	aliphatic ethers, aromatic C-C
867-800, 697	s,m	substituted aromatic CH bend
2082, 1947, 666	w	unassigned

OTHER REMARKS:

Peaks at 2365-2340 cm^{-1} due to presence of CO_2.

Bands at 867, 800, and 697 are suggestive of symmetrically substituted aromatic rings, e.g., 1,3,5-trisubstituted benzene.

Probable aromatic hydrocarbons and alkylated derivatives and unsaturated hydrocarbons.

TABLE 8-94.
IR REPORT

SAMPLE: 9A-C, final cooler cooling tower hot well, pH 2 extract: concentrate IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3600, 3470	s	"Free" alcoholic OH, aromatic amines "free" NH
3300-3100	(broad)	NH stretch of H-bonded amine or OH stretch of H-bonded alc.
3030, 3005	s	aryl or vinyl CH stretch
2920, 2960	s,m	alkyl CH stretch
1720	s	aliphatic ketone or ester
1615	s	NH banding of 1° amines
1595, 1500, 1495	s	NH banding of 2° amines + aryl or vinyl C⋯C
1455, 1375	s,w	alkyl, CH bend
1280-1200	m-w	aromatic CH bends or ester of α,β-unsat. acids or aromatic acids, aromatic CN stretch, or aryl ether
1150, 1110, 1035	s,w,w	aliphatic or aromatic ester, aliphatic ether, or amine C-N
835, 730	s,m	substituted aromatic CH
1415, 1320, 1175, 930, 880, 690	w	unassigned

OTHER REMARKS:

Sample predominantly amines, diphatic ketones or esters of aromatic acids, and some alcoholic compounds.

TABLE 8-95.
IR REPORT

SAMPLE: 9A-LC1, final cooler cooling tower hot well, pH 2 extract: LC cut #1 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
2964, 2916, 2821	w	aliphatic CH stretch
1494	s	aromatic C$\overset{\cdots}{-}$C
1462	s	aliphatic CH bend, or aromatic
1412, 1377	m	aliphatic CH band
1333	s	C-N of teriary amine
863, 670	m	substituted aromatic CH band, alkane, or C-Cl
1749, 1723, 995	w	unassigned

OTHER REMARKS:

This sample possessed less mass than that required by the Level 1 criteria for IR analysis. A spectrum of acceptable quality was obtained by using Fourier Transform IR techniques.

Sample appears to contain predominantly aliphatic and aromatic tertiary amines.

TABLE 8-96.
IR REPORT

SAMPLE: 9A-LC2, final cooler cooling tower hot well, pH 2 extract: LC cut #2 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3055	w	aromatic C-H, -CH$_2$-halogen
2925, 2856	s	aliphatic C-H
1725	w	ketone, ester
1602	w	aromatic C$\overset{\cdots}{-}$C
1453	m	aromatic, aliphatic
1376	w	methyl CH bend
841, 814	m	aromatic
739	s	aromatic, C-Cl
1191, 1034	w	unassigned

OTHER REMARKS:

This sample possessed less mass than that required by the Level 1 criteria for IR analysis. A spectrum of acceptable quality was obtained by using Fourier Transform IR techniques.

TABLE 8-97.
IR REPORT

SAMPLE: 9A-LC3, final cooler cooling tower hot well, pH 2 extract: LC cut #3 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3048	m	aromatic C-H, $-CH_2$-halogen
2927	s	aliphatic C-H
2858	m	aliphatic C-H
1727	w	ketone, ester
1601	m	aromatic $C\overset{\cdots}{-}C$
1450	m	aliphatic CH bend
1380	w	methyl CH bend
1264	w	ester, ether
942	w	aliphatic, aromatic
882	m	aliphatic, aromatic
812	m	aliphatic, aromatic, C-Cl
745	s	
1184, 1163, 1033	w	unassigned

OTHER REMARKS:

This sample possessed less mass than that required by the Level 1 criteria for IR analysis. A spectrum of acceptable quality was obtained by using Fourier Transfrom IR techniques.

Probable PNA hydrocarbon.

TABLE 8-98.
IR REPORT

SAMPLE: 9A-LC4, final cooler cooling tower hot well, pH 2 extract: LC cut #4 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3418	s	OH, NH
3062	w	aromatic C-H
2959, 2933, 2856	w	aliphatic C-H
1719	w	ketone, ester
1459	s	aromatic, aliphatic CH bend
1434	m	aromatic, methyl, methylene
1095	m	aromatic
746	s	multiplet-aromatic, C-Cl

OTHER REMARKS:

2363 and 2336 due to CO_2.

TABLE 8-99.

IR REPORT

SAMPLE: 9A-LC5, final cooler cooling tower hot well, pH 2 extract: LC cut #5 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3418	w	OH, NH
2932, 2856	s	aliphatic C-H
1719	w	ketone, ester
1458	m	aromatic, methyl, methylene
746	m	aromatic, C-Cl
670	s	aromatic, C-Cl
1287, 1095, 1013	w	unassigned

OTHER REMARKS:

This sample possessed less mass than that required by the Level 1 criteria for IR analysis. A spectrum of acceptable quality was obtained by using Fourier Transform IR techniques.

2363 and 2336 due to CO_2. Probable aromatic alcohol or amine.

TABLE 8-100.
IR REPORT

SAMPLE: 9A-LC6, final cooler cooling tower hot well, pH 2 extract: LC cut #6 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3363	m	OH
3041	m	aromatic C-H
2925	s	aliphatic C-H
2856	m	aliphatic C-H
1705	s	ketone, ester
1596, 1506	s	aromatic $C\overset{\cdots}{-}C$
1459	s	aliphatic CH bend
1376	m	methyl CH bend
1287	s	ether ester of aromatic acid, alcohol, or phenol
753	m	substituted aromatic CH bend

OTHER REMARKS:

Probable alcohols or alkylated phenols.

TABLE 8-101.
IR REPORT

SAMPLE: 9A-LC7, final cooler cooling tower hot well, pH 2 extract: LC cut #7 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3287	w	alcoholic, phenolic, or acidic OH
2927	s	aliphatic C-H
2856	m	aliphatic C-H
1738	s	ketone, ester
1693	m	ketone, acid
1597, 1558	m	aromatic $C\overset{\cdots}{-}C$
1455, 1417	m	aromatic, methyl, methylene
749	w	unassigned

OTHER REMARKS:

This sample possessed less mass than that required by the Level 1 criteria for IR analysis. A spectrum of acceptable quality was obtained by using Fourier Transform IR techniques.

Probable alkylated phenols, ketones or carboxylic acids.

TABLE 8-102.
IR REPORT

SAMPLE: 9B-P, final cooler cooling tower hot well, pH 12 extract: preliminary IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3300, 3100	m (broad)	alcoholic OH or amine or amide NH
3058	w	aromatic or olefinic CH
2928, 2857	s,m	aliphatic CH
1727	s	ester or aliphatic ketone
1597	s	aromatic $C\overset{\cdots}{-}C$, amine NH bend
1502	m	aromatic $C\overset{\cdots}{-}C$
1455, 1178	s	aliphatic CH bend, ester, aromatic amine C-N
1106, 1059	m	ether, ester, aliphatic amine
746	s(b)	substituted aromatic CH bend and NH bend of 1°
		amines
834, 811	w	unassigned

OTHER REMARKS:

This sample possessed less mass than that required by the Level 1 criteria for IR analysis. A spectrum of acceptable quality was obtained by using Fourier Transform IR techniques.

Doubled at 1242 and 1172 cm^{-1} highly suggestive of CN stretching of aromatic amines. Probable alkylated aromatic amines, and esters of aromatic acids.

TABLE 8-103.

IR REPORT

SAMPLE: 9B-C, final cooler cooling tower hot well, pH 12 extract: concentrate IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3620	m	alcoholic free OH stretch
3600, 2900	(broad)	alcoholic OH, amide or amine NH
3070, 3006	s	aromatic or olefinic CH stretch
2990, 2959, 2890	s,s	aliphatic CH stretch
1630, 1610	s	1° amine-NH bend, or amide
1590, 1515	m,s	aromatic $\mathrm{C}\overset{\cdots}{-}\mathrm{C}$
1580, 1480	s	aromatic $\mathrm{C}\overset{\cdots}{-}\mathrm{C}$
1450, 1380, 1350	w,m,w	gem-dimethyl CH vibration
1295	m	aromatic amine CH
1260	m (broad)	aliphatic amine CH or alcohol
1190, 1010	m-w	aromatic fingerprint region, ether, alcohol, aliphatic amine or amide
850, 680	s (broad)	1° and/or 2° amine NH wagging and CH bend of aromatic compounds, including heterocyclic amines
760, 700	m	substituted benzene
1325, 958, 950, 940 and 895	w	unassigned

OTHER REMARKS:

Sample predominantly alcohols, aniline, and alkylated anilines (both N- and ring substituted). Bands at 1380 cm^{-1} and 1350 cm^{-1} suggest that alkylated derivatives are primarily i-pr or t-bu compounds. Also, the series of bands in region of 1630 - 1450 may arise from heterocyclic aromatic amines such as pyridine and quinoline, as well as from the carbon homologs.

TABLE 8-104.
IR REPORT

SAMPLE: 9B-LC1, final cooler cooling tower hot well, pH 12 extract: LC cut #1 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
2956, 2926, 2859	s	aliphatic CH stretch
1743	w	ester, or aliphatic ketone
1464	m	aromatic C$\overset{\cdots}{-}$C stretch, or aliphatic CH bend
1452, 1379	w	aliphatic CH bend
723	w	$-(CH_2)_4$ - rocking or substituted aromatic CH bend
1258, 1021	w	unassigned

OTHER REMARKS:

Sample contains predominantly saturated hydrocarbons and saturated ketones. Possibly small amounts of saturated esters.

TABLE 8-106.
IR REPORT

SAMPLE: 9B-LC2, final cooler cooling tower hot well, pH 12 extract: LC cut #2 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
2954, 2926, 2858	s	aliphatic CH stretch
1462, 1450	m	aliphatic CH bend
1377	w	methyl CH bend
809	w	substituted aromatic CH bend
1193, 1143, 1119	w	unassigned

OTHER REMARKS:

This sample possessed less mass than that required by the Level 1 criteria for IR analysis. A spectrum of acceptable quality was obtained by using Fourier Transform IR techniques.

Sample contains only saturated hydrocarbons with trace amounts of aromatic compounds.

TABLE 8-106.
IR REPORT

SAMPLE: 9B-LC3, final cooler cooling tower hot well, pH 12 extract: LC cut #3 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
2957, 2928, 2853	s	aliphatic-CH
1733	m	ester or aliphatic ketone
1456, 1375	m	aliphatic CH bend
751	w	$(\text{-CH}_2)_4$ - or substituted aromatic
1687, 1288, 1265	w	unassigned

OTHER REMARKS:

Probable saturated hydrocarbons.

TABLE 8-107.
IR REPORT

SAMPLE: 9B-LC3, final cooler cooling tower hot well, pH 12 extract: LC cut #3 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
2959, 2929, 2859	s	aliphatic CH stretch
1456	m	aliphatic CH bend
1379	w	methyl CH bend
1262	w	t-butyl
752	w	substituted aromatic CH bend
1738, 1597, 1380, 1280, 1021	w	unassigned

OTHER REMARKS:

Probable saturated and alkylated aromatic hydrocarbons.

TABLE 8-108.
IR REPORT

SAMPLE: 9B-LC4, final cooler cooling tower hot well, pH 12 extract: LC cut #4 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
2956, 2927, 2856	s	aliphatic CH stretch
1735	m	aliphatic ketone or ester
1604, 1496	w	aromatic C$\overset{\cdots}{-}$C stretch
1455, 1377	m,w	aliphatic CH bend
1276, 1121	w	aromatic ester $Ø-\overset{\overset{O}{\|}}{C}-O$ stretch
745, 698	w	substituted aromatic CH or C-Cl
1216, 1073, 1020	w	unassigned

OTHER REMARKS:

Sample appears to be predominantly aliphatic ketones, with some aromatic esters of considerable aliphatic character present.

Shape spike @ 668 cm^{-1} remains unidentified.

TABLE 8-109.
IR REPORT

SAMPLE: 9B-LC5, final cooler cooling tower hot well, pH 12 extract: LC cut #5 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
2959, 2932, 2856	s	aliphatic CH
1733	s	ester or aliphatic ketone
1465	m	aliphatic CH bend
1287, 1274	s	ester of aromatic acid, aromatic ether
1123, 1075	m	ester or ether
746, 695	w	substituted aromatic CH bend, C-Cl
3244, 1602, 1582, 1383, 952, 876	w	unassigned

OTHER REMARKS:

Probable aliphatic esters of aromatic acids.

TABLE 8-110.
IR REPORT

SAMPLE: 9B-LC6, final cooler cooling tower hot well, pH 12 extract; LC cut #6 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3500-2500	broad	1° or 2° amines and 1° or 2° amides
3055	s	aromatic CH
2924, 2856	s	aliphatic CH
1595, 1506	s	aromatic C$\overset{\cdots}{-}$C, amide I and II bands
1460, 1376	m	aliphatic CH bend
1246	s	aliphatic or aromatic C-N
897, 699	s	substituted aromatic compounds
2068, 1924, 1314,		
1157, 1040, 944	w	unassigned

OTHER REMARKS:

Sample appears to be predominantly aromatic and aliphatic amines or amides.

TABLE 8-111.

IR REPORT

SAMPLE: 9B-LC7, final cooler cooling tower hot well, pH 12 extract; LC cut #7 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
2953, 2930, 2854	s	alkyl CH stretch
2061	s	isothiocyanate or keterimines (-N=C=S) (C=C=N)
1603	s	unresolved $C\overset{\cdots}{-}C$ stretch of sub. aromatic compound
1462	m	alkyl CH bend
756, 699	m	substituted aromatic CH bend
1656, 1497, 1280	w	unassigned

OTHER REMARKS:

This sample possessed less mass than that required by the Level 1 criteria for IR analysis. A spectrum of acceptable quality was obtained by using Fourier Transform IR techniques.

Sample contains alkylated aromatic compounds and/or alkyl or aryl isothiocyanates or keterimines.

TABLE 8-112.
IR REPORT

SAMPLE: 10A-P, final cooler cooling tower cold well, pH 2 extract: preliminary IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3500-3200	w (broad)	alcoholic or phenolic OH
3056	w	aromatic or olefinic CH
2959, 2918,		
2849	m,s,s	aliphatic CH stretch
1712	s	ketone, ester
1689-1644		ketone, acid
1603, 1495	m	aromatic $C\overset{\cdots}{-}C$
1461, 1380	m,w	aliphatic CH bend
1243	s (broad)	phenol, alcohol, acid, ester
809, 741, 698	m,s,m	sub. aromatic CH bend
1724, 1432,		
1123, 1009		
837	w	unassigned

OTHER REMARKS:

Probable alkylated phenols and carboxylic acids.

TABLE 8-113.
IR REPORT

SAMPLE: 10A-C, final cooler cooling tower cold well. pH 2 extract: concentrate IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3620, 3500	s	free alcoholic or phenolic OH
3500-2900	2 (broad bands)	banded OH-alcohol or phenol
3030	s	aromatic or olefinic CH stretch
2950, 2890	s	aliphatic CH stretch
1712	w	ketone or ester
1630, 1610	s (broad)	substituted aromatic $C\overset{\cdots}{-}C$
1520, 1500	s	aromatic or olefinic $C\overset{\cdots}{-}C$
1465, 1390,		
1365	s,m,m	aliphatic CH bend
1190-1160, 1115	s,m	alcoholic or phenolic C-O, or aliphatic ethers
890, 845, 695	w,m,w	substituted aromatic CH
1422, 1330,		
1320, 1290,		
1275, 1040, 945	w	unassigned

OTHER REMARKS:

Sample predominantly alcohols, and alkylated phenols. Small peak at 1712 cm^{-1} suggests that small quantities of carboxylic acids, ketones, and/or esters might be present.

TABLE 8-114.
IR REPORT

SAMPLE: 10A-LC1, final cooler cooling tower cold well, pH 2 extract: LC cut #1 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
2949, 2923,		
2854	s	alkyl CH stretch
1748, 1711	w	ester and/or ketone
1463, 1379	w	alkyl CH bend
1154, 1197	w	unassigned

OTHER REMARKS:

This sample possessed less mass than that required by the Level 1 criteria for IR analysis. A spectrum of acceptable quality was obtained by using Fourier Transform IR techniques.

Sample appears to contain only aliphatic hydrocarbons, esters, and ketones.

TABLE 8-115.
IR REPORT

SAMPLE: 10A-LC2, final cooler cooling tower cold well, pH 2 extract: LC cut #2 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3045	w	aromatic or olefinic CH
2954, 2926,		
2857	s	aliphatic CH stretch
1726	w	ketone or ester
1459, 1378	m,w	aliphatic CH bend
1261	w	aromatic ester C-CO-O stretch
841-699	w	aromatic CH bending (substituted)
1039, 876	w	unassigned

OTHER REMARKS:

This sample possessed less mass than that required by the Level 1 criteria for IR analysis. A spectrum of acceptable quality was obtained by using Fourier Transform IR techniques.

Sample predominantly saturated and aromatic hydrocarbons, with some aromatic and/or alkyl esters.

TABLE 8-116.
IR REPORT

SAMPLE: 10A-LC3, final cooler cooling tower cold well, pH 2 extract: LC cut #3 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
2942, 2930,		
2859	s	aliphatic CH stretch
1462	m	aliphatic CH bend
840	m	aromatic, unsaturated CH bend
746	s	aromatic CH bend
881	w	unassigned

OTHER REMARKS:

This sample possessed less mass than the required by the Level 1 criteria for IR analysis. A spectrum of acceptable quality was obtained by using Fourier Transform IR techniques.

Probably alkylated aromatics.

TABLE 8-117.
IR REPORT

SAMPLE: 10A-LC4, final cooler cooling tower cold well, pH 2 extract: LC cut #4 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3398	s	phenolic or alcoholic OH
2952, 2932,		
2863	s	aliphatic CH stretch
1719	s	ketone/ester
1452	s	aliphatic CH bend
1027	m	ether, aliphatic ester
746, 725	s	$(-CH_2-)_4$ or substituted aromatic CH bend

OTHER REMARKS:

Probable aliphatic ketones, esters, or ethers and/or alkylated phenols.

TABLE 8-118.

IR REPORT

SAMPLE: 10A-LC5, final cooler cooling tower cold well, pH 2 extract: LC cut #5 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3411	s	alcoholic or phenolic OH
3336	m	alcoholic or phenolic OH
2959, 2932, 2856	s	aliphatic CH
1712	m	ketone or ester
1602, 1589	w	aromatic or olefinic C$\overset{\cdot\cdot}{-}$C
1452, 1342	s	aliphatic CH bend
1090, 1013	m	phenolic or alcoholic CO stretch, aliphatic ether or ester
739	s	substituted aromatic CH bend or C-Cl
1280, 1218, 3055, 698	w	unassigned

OTHER REMARKS:

Probable alkylated phenols and some aliphatic ketones and/or esters.

TABLE 8-119.
IR REPORT

SAMPLE: 10A-6, final cooler cooling tower cold well, pH 2 extract; LC cut #6 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3300-2500	s (broad)	carboxylic acid OH phenolic OH stretch
3034	s	aromatic CH stretch
2959, 2924,		
2863	s	aliphatic CH stretch
1698	s	asym. C=O stretch for saturated and unsaturated/
		aromatic carboxylic isomer
1595	s	aromatic $C \overset{\cdot\cdot}{-} C$
1500-1600	m	aromatic $C \overset{\cdot\cdot}{-} C$
1458, 1376	m,w	aliphatic CH
1266, 1157, 1026	m	C-O of carboxylic acids and phenols
835, 773, 752,		
691	m	aromatic compounds-substituted
2068, 1869, 931	w	unassigned

OTHER REMARKS:

Sample predominantly aromatic and aliphatic carboxylic acids and/or alkylated phenols.

TABLE 8-120.
IR REPORT

SAMPLE: 10A-LC7, final cooler cooling tower cold well, pH 2 extract: LC cut #7 IR

Wave Number (cm^{-1})	**Intensity**	**Assignment/Comments**
2962, 2920,	m	alkyl CH stretch
2852		
1738	m	ester, or aliphatic ketone
1703	s	ketone or ester
1618, 1439 (?)	m	aromatic or olefinic $\mathrm{C}\overset{\cdot\,\cdot}{\text{—}}\mathrm{C}$
1104, 1042	m	aliphatic ethers, or 2° alcohol
1676, 863, 834	w	unassigned

OTHER REMARKS:

This sample possessed less mass than that required by the Level 1 criteria for IR analysis. A spectrum of acceptable quality was obtained by using Fourier Transform IR techniques.

Sample appears to contain only residual aliphatic ketones and esters.

TABLE 8-121.
IR REPORT

SAMPLE: 10B-C, final cooler cooling tower cold well, pH 12 extract: concentrate IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3400 - 3000	s(broad)	amine or amide NH stretch
3062	s	aromatic or olefinic CH stretch
2954, 2870	m	aliphatic CH stretch
2151, 2055	w	ketenes (C=C=O) and isothiocyanates
1705, 1664	s	amide I bands (N=C=S)(C=O stretch)
1604, 1515	s	amide II bands (N-H bend) or amine NH bend, or
		aromatic $C \overset{\cdots}{-} C$
1500	s	aromatic $C \overset{\cdots}{-} C$
1445	s	aliphatic CH or saturated 1° amide
1376	m	aliphatic CH bend
1322		aromatic amine C-N
1267 - 1034	w	aromatic fingerprint region and/or amino C-N
		stretching
900 - 800	m(broad)	amine and/or amide NH bend
746 - 691	s,m	monosubstituted benzene
1548	w	unassigned

OTHER REMARKS:

Sample predominantly aryl and/or alkyl amines and amides; bands at 3062, 1664, 1604, 815, 746, and 691^{+1} strongly suggesting that appreciable amounts of aniline, N-alkylated aniline, and/or amides of benzoic acid are present.

TABLE 8-122.
IR REPORT

SAMPLE: 10B-LC1, final cooler cooling tower cold well, pH 12 extract: LC cut #1 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
2957, 2928,		
2853	s	aliphatic CH stretch
1750	w	ketone or ester
1462, 1375	m,w	aliphatic CH bend
1467, 722	w	unassigned

OTHER REMARKS:

Sample contains predominantly saturated hydrocarbons.

TABLE 8-123.
IR REPORT

SAMPLE: 10B-LC2, final cooler cooling tower cold well, pH 12 extract: LC cut #2 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
2854, 2956,		
2947, 2424	s	aliphatic CH stretch
1457, 1463,		
1380	m	aliphatic CH bend
1261, 1161	w	aromatic or aliphatic ether
1015, 1038	w	aromatic or aliphatic ether
810, 804	w	substituted aromatic CH bend or C-Cl
1600, 1586	w	unassigned

OTHER REMARKS:

This sample possessed less mass than that required by the Level 1 criteria for IR analysis. A spectrum of acceptable quality was obtained by using Fourier Transform IR techniques.

Probable saturated hydrocarbons, with some aromatic or aliphatic ethers.

TABLE 8-124.
IR REPORT

SAMPLE: 10B-LC3, final cooler cooling tower cold well, pH 12 extract: LC cut #3 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
2959, 2929,		
2859	s	aliphatic CH stretch
1738	w	ester or aliphatic ketone
1462, 1380	w	aliphatic CH bend
1262	w	alkane, aromatic, aromatic ether, ester of
		aromatic acid
1028	w	aromatic or aliphetic ether ester of aromatic acid
746, 722	w	-$(CH_2)_4$ - rocking or substituted aromatic CH bend

OTHER REMARKS:

This sample possessed less mass than that required by the Level 1 criteria for IR analysis. A spectrum of acceptable quality was obtained by using Fourier Transform IR techniques.

Probable diaphatic esters of aromatic acids, or aliphatic or aromatic ethers.

TABLE 8-125.
IR REPORT

SAMPLE: Final cooler cooling tower cold well, pH 12 extract: LC cut #4 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
2959, 2929,	s	aliphatic CH stretch
2859		
1730	m	ester or aliphatic ketone
1456, 1380	m,w	aliphatic CH bend
1116	w	saturated ester and/or ether
746, 711	w	substituted aromatic CH bend
1439	w	unassigned

OTHER REMARKS:

This sample possessed less mass than that required by the Level 1 criteria for IR analysis. A spectrum of acceptable quality was obtained by using Fourier Transform IR techniques.

Sample contains predominantly aliphatic hydrocarbons and/or esters, with some substituted aromatic compounds.

TABLE 8-126.
IR REPORT

SAMPLE: 10B-LC5, final cooler cooling tower cold well, pH 12 extract: LC cut #5, IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
2962, 2923,	w	aliphatic CH stretch
2853		
1648	m	term vinyl, NH_2 in plane bending
1508	m	-NH-, aromatic $C\overset{\cdots}{-}C$
1460	m	aliphatic CH, aromatic or olefinic $C\overset{\cdots}{-}C$
680	m	$-NH_2-$ out of plane bending or aromatic CH bend
1750	w	unassigned

OTHER REMARKS:
Probable saturated and unsaturated hydrocarbons, or alkylated aromatic derivatives.

TABLE 8-127.

IR REPORT

SAMPLE: 10B-LC6, final cooler cooling tower cold well, pH 12 extract: LC cut #6 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3671 - 3165	s	alcohol, amine, amide
3062	s	aromatic CH stretch
2925, 2856	s	aliphatic CH stretch
2733, 2603	m	saturated amine
1678	m	amide I band
1596, 1507	s	aromatic C$\overset{\cdots}{-}$C, NH bending of 1° amide or amine
1465, 1376	s,w	aliphatic CH bend
1267 - 1246	s	alcohol, aromatic ether, aromatic amine
1157, 1122, 1040	m	ether, alcohol, phenol, amide NH bend or amine CN
808, 787, 752 691	s	sub. aromatic CH bend
1314, 945	w	unassigned

OTHER REMARKS:
Probable alkylated aromatic amines.

TABLE 8-128.
IR REPORT

SAMPLE: 10B-LC7, final cooler cooling tower cold well, pH 12 extract: LC cut #7 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
~3569	s	alcoholic OH, amino NH stretch
3267	s(broad)	alcoholic OH, amine or amide NH
2925, 2856	s	aliphatic CH stretch
2062	m	isothiocyanate
1657	s	conj. olefinic $C\overset{\cdots}{-}C$, amide I band or amine NH bend
1602	s	aromatic $C\overset{\cdots}{-}C$, amine or 1° amide NH
1541 - 1507	m	aromatic $C\overset{\cdots}{-}C$, 2° amide NH
1459, 1376	m	aliphatic CH bend
1287	m	aromatic amine CN stretch, aromatic ether
1123 - 1075	m	alcohol, ether, amine C-N
753 - 698	m	substituted aromatic CH bend
828	w	unassigned

OTHER REMARKS:

This sample possessed less mass than that required by the Level 1 criteria for IR analysis. A spectrum of acceptable quality was obtained by using Fourier Transform IR techniques.

Probable alkylated aromatic amides and amines.

TABLE 8-129.
IR REPORT

SAMPLE: 3X-P, vapor above tar storage tank, XAD-2 resin: preliminary IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3060, 3031	w	aromatic or olefinic CH
2964, 2930, 2874	s	aliphatic CH stretch
1725	m	ketone or ester
1602, 1495	m	aromatic CH bend
1455, 1376	m,w	aliphatic CH bend
1275, 1106, 1067	m	ester of aromatic acid, aromatic and/or aliphatic ether
802, 751, 701	w,w,m	sub. aromatic CH bend
1027, 892, 830	w	unassigned

OTHER REMARKS:

Sample predominantly aliphatic and aromatic esters and ethers. IR spectrum suggests that sample is predominantly esters of aromatic acids and alkyl ethers.

TABLE 8-130.
IR REPORT

SAMPLE: 3X-C, vapor above tar storage tank, XAD-2 resin: concentrate IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3071, 3054, 3007	w,m,w	aromatic and/or olefinic CH
2967 - 2863	w	aliphatic CH stretch
1954 - 1676	w	aromatic overtone region
1595, 1387	m	aromatic or conjugated olefinic $\mathrm{C}\overset{\cdots}{-}\mathrm{C}$
1213 - 1011	w	aromatic fingerprint region
958	m	conjugated vinyl CH bend, or aromatic in-plane bend
785 - 698	s-w	substituted aromatic CH bend
1566, 1508, 1364, 843	w	unassigned

OTHER REMARKS:

Sample predominantly aromatic and unsaturated hydrocarbons.

TABLE 8-131.
IR REPORT

SAMPLE: 3X-LC1 vapor above tar storage tank, XAD-2 resin: LC cut #1 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
2975, 2936,	s	aliphatic CH
2859		
1513, 1464	m	aliphatic stretch
1282, 1216, 970	m	aliphatic stretch

OTHER REMARKS:

This sample possessed less mass than that required by the Level 1 criteria for IR analysis. A spectrum of acceptable quality was obtained by using Fourier Transform IR techniques.

Probable aliphatic hydrocarbons.

TABLE 8-132.
IR REPORT

SAMPLE: 3X-LC2, vapor above tar storage tank, XAD-2 resin: LC cut #2 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3060, 3025	w	aromatic CH stretch
2963, 2924,	s	aliphatic CH stretch
2857		
1604, 1494	w	aromatic C--C stretch
1455, 1375	m,w	aliphatic CH bend
800, 752	w	sub. aromatic CH bend
752, 699	w,m	sub. aromatic CH bend
1589, 1535,	w	unassigned
1261, 1029,		
889		

OTHER REMARKS:

Sample predominantly saturated hydrocarbons and mono-substituted benzene.

TABLE 8-133.
IR REPORT

SAMPLE: 3X-LC3, vapor above tar storage tank, XAD-2 resin: LC cut #3 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3025	w	aromatic CH stretch
2961, 2926,	s	aliphatic CH stretch
2854		
1741, 1732	w	ester of aromatic acid, Ø-CO-O
1603, 1588,	w	aromatic C$\overset{\cdots}{\text{—}}$C stretch
1494		
1462, 1453,	w	aliphatic CH bend
1377		
799, 758, 705	w,w,m	sub. aromatic compds, primarily
		monosub. benzene
1263, 1072,	w	unassigned
1031, 893		

OTHER REMARKS:

Sample predominantly saturated hydrocarbons, sat. ketones or ester, containing trace of aromatic compds.

TABLE 8-134.
IR REPORT

SAMPLE: 3X-LC4, vapor above tar storage tank, XAD-2 resin: LC cut #4 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
2959, 2930,	s	aliphatic CH stretch
2859		
1726	m	ester, or aliphatic ketone
1462	m	aromatic $C\overset{\cdots}{-}C$
1456, 1380	m,w	aliphatic CH bend
1268, 1110,	m,w,w	ester of aromatic acid, aromatic and/or
1028		aliphatic ether
799, 752, 711	w,w,m	substituted aromatic
1585, 1069	w	unassigned

OTHER REMARKS:

This sample possessed less mass than that required by the Level 1 criteria for IR analysis. A spectrum of acceptable quality was obtained by using Fourier Transform IR techniques.

Sample contains predominantly alkylated esters of aromatic acids, and/or saturated hydrocarbons.

TABLE 8-135.
IR REPORT

SAMPLE: 3X-LC5, vapor above tar storage tank, XAD-2 resin: LC cut #5 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
2959, 2932	s	aliphatic CH stretch
2856		
1726	s	ester, or aliphatic ketone
1459, 1376	m,w	aliphatic CH bend
1274, 1116,	s,w	ester of aromatic acid, aromatic
1075		or aliphatic ether
801, 746, 712	w	substituted aromatic
1027	w	unassigned

OTHER REMARKS:

This sample possessed less mass than that required by the Level 1 criteria for IR analysis. A spectrum of acceptable quality was obtained by using Fourier Transform IR techniques.

Sample predominantly saturated hydrocarbons and alkyl esters of aromatic acids and/or alkyl and aryl ethers.

TABLE 8-136.
IR REPORT

SAMPLE: 3X-LC6, vapor above tar storage tank, XAD-2 resin: LC cut #6 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3600 - 3200	w(broad)	alcoholic or phenolic OH
3065, 3029	w	aromatic or olefinic CH stretch
2959, 2928, 2883	s	aliphatic CH stretch
1726	s	ester or aliphatic ketone
1604, 1514, 1497	m,w,m	aromatic or conj. olefinic $\mathrm{C}\overset{\cdots}{-}\mathrm{C}$
1464, 1456	s	aliphatic CH bend
1378, 1357	m	gem-dimethyl CH bend
1273, 1113		ester of aromatic acid
1220 - 1080	m	aromatic fingerprint region
749, 711, 699	w - m	substituted aromatic CH bend
1681, 1312, 1029, 1022, 824, 800	w	unassigned

OTHER REMARKS:
Sample predominantly alkylated esters of aromatic acids and alcohols.

TABLE 8-137.
IR REPORT

SAMPLE: 3X-LC7, vapor above tar storage tank, XAD-2 resin: LC cut #7 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3082, 2065,	w	aromatic or olefinic CH
3030		
2957, 2927,	s	aliphatic CH stretch
2854		
1746	m	ester or aliphatic ketone
1604, 1586,	m,w,s	aromatic $C\overset{\cdots}{-}C$
1497		
1455, 1357	s,m	aliphatic CH bend
1220, 1148	s,m	aliphatic ester of aromatic acid
752, 732, 699	m,m,s	sub. aromatic, predominantly monosub benzene
1080, 1029, 988,	w	unassigned
934, 886		

OTHER REMARKS:

Sample predominantly ester of aromatic or α,β-unsaturated acid and primary alcohols.

TABLE 8-138.
IR REPORT

SAMPLE: 3XR-C, vapor above tar storage tank: canister rinse: concentrate IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3071, 3053,	w,m,w	aromatic or olefinic CH stretch
3035		
2980	w	aliphatic CH stretch
1595 - 1502	w	aromatic $C\overset{\cdots}{-}C$ stretch
1388	m	α-naphthalenes
1354	w	methyl CH
960	m	H-C=C-H trans or aromatic CH
846	w	aromatic or olefinic CH
780	s	substituted aromatic CH
1274, 1127,	w	unassigned
1007		

OTHER REMARKS:

Inverted peaks at 2365-2340 cm^{-1} are due to presence of CO_2.

This sample was known to contain significant amounts of naphthalene (which crystallized out upon concentration), and the above unassigned weak bands are believed to be due to the presence of these aromatic compds, which give rise to several bands in the region 950-1200 cm^{-1}; the fingerprint region for aromatic compds.

TABLE 8-139.
IR REPORT

SAMPLE: 3XR-LC1, vapor above tar storage tank, canister rinse: LC cut #1 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
2959, 2924	s	aliphatic CH stretch
2856		
1733	m	ester or aliphatic ketone
1459	m	aliphatic CH
1376	w	methyl CH
1274	w	conjugated ester or ether C-O or Si-C
1561, 1123,	w	unassigned
1068, 718, 671		

OTHER REMARKS:

Probable saturated hydrocarbons with trace of aromatic ether or ester of aromatic acid.

TABLE 8-140.
IR REPORT

SAMPLE: 3XR-LC2, vapor above tar storage tank, canister rinse: LC cut #2 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3600 - 3000	m(broad)	alcoholic or phenolic OH
3048		aromatic CH
2959, 2931,	s	aliphatic CH
2856		
1719	s	ketone, ester
1452, 1376	m	aliphatic CH bend
1260	m	ether, ester, alcohol, phenol
1095, 1034	m	ether, alcohol, phenol, ester
		of aromatic acid
810	m	monosubstituted benzene
739	m	"
1630, 1239,	w	unassigned
1164, 864		

OTHER REMARKS:

Probable aliphatic esters of aromatic acids and alcohols.

TABLE 8-141.
IR REPORT

SAMPLE: 3XR-LC3, vapor above tar storage tank, canister rinse: LC cut #3 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3055, 3041	m	aromatic CH stretch
2959, 2932,	s	aliphatic CH stretch
2856		
1925	m	aromatic sub.
1732, 1718	m	ketone, ester
1459, 1376	s	aliphatic CH bend
1260, 1089,	m	ester or ether, aromatic CH bend
1020, 958		
780, 746, 712	s	substituted aromatic CH bend
1390, 671, 670,	w	unassigned
1616		

OTHER REMARKS:

This sample possessed less mass than that required by the Level 1 criteria for IR analysis. A spectrum of acceptable quality was obtained by using Fourier Transform IR techniques.

Probable alkylated aromatic ethers and alkylated aromatic hydrocarbons.

TABLE 8-142.
IR REPORT

SAMPLE: 3XR-LC4, vapor above tar storage tank, canister rinse: LC cut #4 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
2959, 2932,	s	aliphatic CH stretch
2856		
1733	s	ester or aliphatic ketone
1459, 1376	m,w	aliphatic CH bend
1287, 1123,	s,m,w	ester of aromatic acid and/or
1075		aryl and alkyl ethers
739, 660	m	monosubstituted benzene

OTHER REMARKS:

This sample possessed less mass than that required by the Level 1 criteria for IR analysis. A spectrum of acceptable quality was obtained by using Fourier Transform IR techniques.

Spectrum strongly suggests that sample is predominantly benzoates of 1° and 2° alcohols.

TABLE 8-143.
IR REPORT

SAMPLE: 3XR-LC5, vapor above tar storage tank, canister rinse: LC cut #5 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
2961, 2929,	s	aliphatic CH
2861		
1733	s	ester or aliphatic ketone
1457	m	aliphatic CH bend
1376	w	methyl CH bend
1276, 1126	m	aliphatic ester of aromatic acid
1075, 744	w,m	substituted aromatic CH or ethyl C-C
744, 701	m	substituted aromatic CH
1038	w	unassigned

OTHER REMARKS:

Sample predominantly aliphatic esters and/or sat. hydrocarbons but bands at 1075, 1038, 744, and 701 cm^{-1} suggest presence of same aromatic cmpds.

TABLE 8-144.
IR REPORT

SAMPLE: 3XR-LC6, vapor above tar storage tank, canister rinse: LC cut #6 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3215	w	alcoholic or phenolic OH
3055	w	aromatic CH stretch
2959, 2432, 2856	s	aliphatic CH stretch
1739	s	ester or aliphatic ketone
1602	m	aromatic $\mathrm{C}\overset{\cdots}{-}\mathrm{C}$
1465, 1383	m	aliphatic CH bend
1267, 1	m	ester of aromatic acid or
1178, 1143, 1130, 1025	w	aliphatic or aromatic ethers
746	m	substituted aromatic CH bend
1026, 965, 835, 761, 698	w	unassigned

OTHER REMARKS:

A slight amount of aromatic character.

TABLE 8-145.
IR REPORT

SAMPLE: 3XR-LC7, vapor above tar storage tank, canister rinse: LC cut #7 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3600 - 3200	w(broad)	alcoholic or phenolic OH
2959, 2932,	s	aliphatic CH stretch
2856		
1740	s	ester or aliphatic ketone
1459, 1376	m,w	aliphatic CH bend
1259, 1164,	m	ester of aromatic acid, ether,
1075		alcohol, phenol
746	w	substituted aromatic CH bend
1671, 1602,	w	unassigned
1561, 1034,		
671		

OTHER REMARKS:

Probable alcohols and saturated esters.

TABLE 8-146.
IR REPORT

SAMPLE: 4X-P, tar decanter vapor, XAD-2 resin: preliminary IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3068, 3056	m	aromatic or olefinic CH
2966, 2931,	w	aliphatic CH
2856		
1671, 1958,	w	aromatic combinations/overtones
1924, 1842,		
1787, 1739		
1595, 1390	m	aromatic or olefinic $C\overset{\cdots}{-}C$, or
		monosub. naphthalene
1273 - 1006	w	aromatic fingerprint region
958	m	aromatic or olefinic CH bend
780, 739	s,m	substituted aromatic CH bend
2294, 1821,	w	unassigned
1622, 828,		
615		

OTHER REMARKS:

Sample predominantly unsaturated and aromatic hydrocarbons. IR spectrum suggests that aromatic hydrocarbons are predominantly α- and β-substituted naphthalenes.

TABLE 8-147.
IR REPORT

SAMPLE: 4X-R, tar decanter vapor, XAD-2 resin: concentrate IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3088, 3071,	w,m,s,w	aromatic or olefinic CH
3054, 3007		
2967 - 2863	w	aliphatic CH
1948 - 1624	w	aromatic overtones/combinations
1595, 1387	m	condensed aromatic, α-sub. naphthyl,
		or conj. vinyl $C \overset{\cdots}{-} C$
1271 - 1010	w	aromatic fingerprint region
958	m	conj. olefinic or aromatic CH
779, 739, 698	s,m,w	substituted aromatic cmpds.
2290, 1508,	w	unassigned
1427, 831, 617		

OTHER REMARKS:

Sample predominantly naphthalene, substituted aromatic cmpds, and unsaturated hydrocarbons with some aliphatic groups present.

TABLE 8-148.
IR REPORT

SAMPLE: 4X-LC1, tar decanter vapor, XAD-2 resin: LC cut #1 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
2959, 2930,	s	aliphatic CH stretch
2859		
1739	w	ester or aliphatic ketone
1005	w	aliphatic ester
1457, 1381	m,w	aliphatic CH bend
1686, 1645, 668	w	unassigned

OTHER REMARKS:

This sample possessed less mass than that required by the Level 1 criteria for IR analysis. A spectrum of acceptable quality was obtained by using Fourier Transform IR techniques.

Sample predominantly saturated hydrocarbons with a trace of aliphatic ketones and/or saturated esters.

TABLE 8-149.
IR REPORT

SAMPLE: 4X-LC2, tar decanter vapor, XAD-2 resin: LC cut #2 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
2959, 2930, 2854	s	aliphatic CH stretch
1744	w	ester
1603	w	aromatic $\mathrm{C}\overset{\cdots}{-}\mathrm{C}$
1462, 1380	m,w	aliphatic CH bend
1034	w	aliphatic ester or ether
746	w	substituted aromatic CH bend
1675, 1151, 816	w	unassigned

OTHER REMARKS:

This sample possessed less mass than that required by the Level 1 criteria for IR analysis. A spectrum of acceptable quality was obtained by using Fourier Transform IR techniques.

Sample predominantly aliphatic hydrocarbons, esters and/or ethers. Bands at 1603 and 746 cm^{-1} suggest aromatic cmpds are predominantly monosubstituted benzene.

TABLE 8-150.
IR REPORT

SAMPLE: 4X-LC3, tar decanter vapor, XAD-2 resin: LC cut #3 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3072, 3052,	w	aromatic CH stretch
3030		
2927, 2860	w	aliphatic CH stretch
1449	w	aliphatic CH bend
1261 - 1040	w	aromatic fingerprint region
886, 869	w	substituted aromatic CH bend
818	m	substituted aromatic CH bend
732	s	substituted aromatic CH bend
1398, 1301, 954	w	unassigned

OTHER REMARKS:

Sample predominantly aromatic hydrocarbons and alkylated derivatives; e.g., α- and β-substituted naphthalenes.

TABLE 8-151.
IR REPORT

SAMPLE: 4X-LC4, tar decanter vapor, XAD-2 resin: LC cut #4 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3421, 3395	m,w	1° amine, pyrrole or indole N-H
2955, 2921,	s	aliphatic CH stretch
2854		
1723	w	ketone or ester
1462, 1450,	w,m,w	aliphatic CH bend
1380		
1263	w	ester of aromatic acid
1098, 1086,	w	aliphatic C-N, aromatic ester,
1034		aromatic or aliphatic ethers
805, 749, 725	w,m,s	sub. aromatics CH bend
1336, 1327,	w	unassigned
1239, 1207		

OTHER REMARKS:

This sample possessed less mass than that required by the Level 1 criteria for IR analysis. A spectrum of acceptable quality was obtained by Fourier Transform IR techniques.

Sample predominantly aromatic and aliphatic hydrocarbons with some aromatic and aliphatic esters and ethers and some 1° amino-cmpds or derivatives of pyrrole and/or indole.

TABLE 8-152.
IR REPORT

SAMPLE: 4X-LC5, tar decanter vapor, XAD-2 resin: LC cut #5 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
2959, 2930,	s	aliphatic CH
2854		
1728	w	ketone or ester
1462, 1380	w	aliphatic CH
1280	w	acetate, sat. ester
1034, 740, 670	w	unassigned

OTHER REMARKS:

This sample possessed less mass than that required by the Level 1 criteria for IR analysis. A spectrum of acceptable quality was obtained by Fourier Transform IR techniques.

Sample appears to contain only saturated hydrocarbons and saturated esters.

TABLE 8-153.
IR REPORT

SAMPLE: 4X-LC6, tar decanter vapor, XAD-2 resin: LC cut #6 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
2953, 2930, 2859	s	aliphatic CH stretch
1720	m	ketone or ester
1609	m	aromatic or conj. olefinic $\mathrm{C\overset{\cdots}{-}C}$
1462, 1374	m,w	aliphatic CH bend
1245, 1110	w	ester of aromatic acid, or aliphatic and/or aromatic ethers
1028, 1010	w	aromatic fingerprint region
752	w	sub. aromatic CH bend
1674, 1292	w	unassigned

OTHER REMARKS:

Sample predominantly aliphatic esters of aromatic acids; i.e., benzoates, phthalates, etc.

TABLE 8-154.
IR REPORT

SAMPLE: 4X-7, tar decanter vapor, XAD-2 resin; LC cut #7 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
2959, 2929,	s	aliphatic CH stretch
2859		
1744	m	ester or aliphatic ketone
1668, 1603,	m	aromatic or olefinic $C\overset{\cdots}{-}C$
1556		
1462, 1380	m	aliphatic CH bend
1169, 1110	w,m	aliphatic ester or ether
1075, 1034	w	aromatic fingerprint
722, 828	w	substituted aromatic CH bend
1415	w	unassigned

OTHER REMARKS:

IR spectrum suggests that sample predominantly aromatic or aliphatic esters of saturated carboxylic acids and aliphatic ethers.

TABLE 8-155.
IR REPORT

SAMPLE: 4XR-P, tar decanter vapor, canister rinse: preliminary IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3058	m	aromatic CH stretch
2964 - 2852	w	aliphatic CH stretch
1601	m	conj. DBL-bond, nitroso, aromatic
1495	m	aromatic, nitroso
1447	s	aliphatic CH bend
1265 - 1023	m	aromatic or vinyl ether, ketal or acetal,
		C-N stretching, C-O stretching, alkane
952 - 864	m	epoxy, N-H bending
816	s	aromatic CH bend
781	m	aromatic CH bend
734	s	aromatic CH bend
2339, 1689-2079	w	unassigned

OTHER REMARKS:

2340 & 2370 cm^{-1} due to CO_2.
Probable aromatic hydrocarbons and some aromatic ethers.

TABLE 8-156.
IR REPORT

SAMPLE: 4XR-C, tar decanter vapor, canister rinse: concentrate IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3090, 3050	s(broad)	aromatic CH stretch
2980 - 2880	w	aliphatic CH stretch
1950 - 1650	w	aromatic overtones/combinations
1595, 1509	s	aromatic $\mathrm{C}\overset{\cdots}{-}\mathrm{C}$ stretch
1455	w	aliphatic CH bend
1390, 1360	w	gem-dimethyl CH bend
1270 - 960	s	aromatic fingerprint region
835 - 700	s(broad)	substituted aromatic CH bend
1425, 1320,	w	unassigned
865		

OTHER REMARKS:

Sample predominantly substituted hydrocarbons. Bands at 1390, 1360, 865 cm^{-1} strongly suggest that sample contains significant amounts of α- and β- i-pr and t-bu naphthalenes.

TABLE 8-157.
IR REPORT

SAMPLE: 4XR-LC1, tar decanter vapor, canister rinse: LC cut #1 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
2959, 2925,	s	aliphatic CH
2856		
1733	w	ester, or aliphatic ketone
1465	m	aliphatic CH
1376	w	aliphatic CH
1123 & 1068	w	ester or aliphatic ether
719	w	$-(CH_2)_n^-$ rocking for ≥ 4
1274	w	unassigned

OTHER REMARKS:

Bands at 1733 cm^{-1} and 1123 and 1068 cm^{-1} suggests the presence of trace amounts of esters. Sample predominantly saturated hydrocarbons.

TABLE 8-158.
IR REPORT

SAMPLE: 4XR-LC2, tar decanter vapor, canister rinse: LC cut #2 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3071, 3053	m	aromatic or olefinic -CH
2000 - 1600	w	aromatic combinations/overtones
1507	m	aromatic $C \overset{\cdots}{-} C$
1392	m	α-naphthalenes $C \overset{\cdots}{-} C$
1200 - 1000	m	aromatic fingerprint region
957	m	olefinic C-H (trans)
828	m	substituted aromatic hydrocarbons
781	s	substituted aromatic hydrocarbons
740	s	substituted aromatic hydrocarbons
1456, 1445, 1427, 1245, 699, 617	w	unassigned

OTHER REMARKS:

Sample contained virtually no aliphatic hydrocarbons, but appeared to consist almost entirely of aromatic hydrocarbons. Bands at 781 and 740 cm^{-1} highly suggestive of α-naphthalenes, i.e., 3 adjacent hydrogens on a ring or monosubstituted benzene.

TABLE 8-159.
IR REPORT

SAMPLE: 4XR-U3, tar decanter vapor, canister rinse: LC cut #3 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3425	m	aliphatic 2° amine
3055	w	aromatic or olefinic CH stretch
2966, 2925,	m	aliphatic CH stretch
2856		
1718	w	ketone or ester
1452	s	aliphatic CH bend
1260 - 1027	w - m	C-N stretching of aromatic and
		aliphatic amine
801, 746, 725,	m,s,s	substituted aromatic CH bend
698		
1424, 1335, 993,	w	unassigned
931, 890		

OTHER REMARKS:

This sample possessed less mass than that required by the Level 1 criteria for IR analysis. A spectrum of acceptable quality was obtained by using Fourier Transform IR techniques.

The sample seemed to contain predominantly aliphatic 2° amines. The lack of a medium-to-strong band in the region 1650-1580 cm^{-1} arising from 1° amine NH wagging supports the idea that aliphatic 2° amines are predominant. Strong bands in region 890-700 cm^{-1} suggests appreciable amounts of aromatic hydrocarbons.

TABLE 8-160.
IR REPORT

SAMPLE: 4XR-LC4, tar decanter vapor, canister rinse: LC cut #4 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
2595, 2932,	m	aliphatic CH stretch
2877, 2963		
733	s	ester or aliphatic ketone
1459, 1383	m	aliphatic CH bend
1280, 1274	s	aromatic ether or ester of aromatic acid
1123, 1075	s	aliphatic or aromatic ether or
		ester of aromatic acid
739	m	substituted aromatic CH bend
1041, 965, 831,	w	unassigned
671		

OTHER REMARKS:

This sample possessed less mass than that required by the Level 1 criteria for IR analysis. A spectrum of acceptable quality was obtained by using Fourier Transform IR techniques.

3398 due to uneven sample.

671 & 739 may be due to $MeCl_2$.

Probable aliphatic esters of aromatic acids and alkylated aromatic hydrocarbons.

TABLE 8-161.
IR REPORT

SAMPLE: 4XR-LC5, tar decanter vapor, canister rinse: LC cut #5 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3078	w	aromatic or olefinic CH
2963, 2933, 2878, 2866	s	aliphatic CH
1732	s	ester or aliphatic ketone
1599, 1581	w	aromatic or olefinic C$\overset{\cdots}{-}$C
1465, 1380	m,w	aliphatic CH bend
1280	s	ester of aromatic acid or aromatic ether
1126, 1071	s	ester of aromatic acid, aliphatic or aromatic ether
744, 701	m,w	substituted aromatic CH bend
1041, 956, 762, 653	w	unassigned

OTHER REMARKS:

Sample predominantly aliphatic esters, ethers and/or saturated hydrocarbons, but does contain some aromatic compounds; possibly ester or aromatic acids.

TABLE 8-162.
IR REPORT

SAMPLE: 4XR-LC6, tar decanter vapor, canister rinse, LC cut #6 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3062	w	aromatic or olefinic CH
2966, 2932,	s	aliphatic CH
2856		
1740	s	ester, or aliphatic ketone
1609, 1596	m	aromatic or olefinic C=C stretch
1465	m	aliphatic CH bend or aromatic $C\overset{\cdots}{-}C$ stretch
1130, 1074,	w	aromatic $C\overset{\cdots}{-}C$ stretch, aliphatic ether or ester
1027		
835	w	$-(CH_2)_{\bar{4}}$ rocking or substituted aromatic
780, 753	m	substituted aromatic CH bend
3302, 1643,	w	unassigned
1513		

OTHER REMARKS:

- Splitting pattern about 750 cm^{-1} suggests monosubstituted aromatic compounds are predominant.
- Carbonyl group most likely a keto group due to absence of strong absorption bands @ 1300-1050 cm^{-1} which accompany an ester.

Sample predominantly aliphatic ketones and alkylated aromatic hydrocarbons.

TABLE 8-163.
IR REPORT

SAMPLE: 4XR-LC7, tar decanter vapor, canister rinse: LC cut #7 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3076	w	aromatic CH
2959, 2932,	s	aliphatic CH
2856		
1240	s	ester or aliphatic ketone
2082, 1002	w	cyanide
1465, 1376	w	aliphatic CH bend
1247, 1239	s	ester of aromatic acid, or aromatic ether
1212, 1123,	m	ester of aromatic acid, or aromatic or
1026		aliphatic ether
746, 615	w	substituted aromatic CH bend
1582, 1438,	w	unassigned
1081, 965, 835,		
780, 698		

OTHER REMARKS:

746, 615, 698 possibly due to $MeCl_2$.
Sample predominantly aliphatic esters of aromatic acids.

TABLE 8-164.
IR REPORT

SAMPLE: 11A-P, tar decanter vapor, condensate extract pH 2: preliminary IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3300 - 2500	m	broad O-H stretch of carboxylic acid,
		alcohol or phenol
3058	m	aromatic CH stretch
2924, 2856	w	aliphatic CH stretch
1691	m	carboxylic acid dimer-asym. -CO-O stretch,
		aromatic or conj. acid
1594, 1502	m	aromatic or olefinic $C\overset{\cdots}{-}C$
1453, 1380	w	aliphatic CH bend
1246	m	C-O stretch of carboxylic acid or phenol
886, 813, 782,	w - s - w	substituted aromatic compounds
740, 691		
1929, 953, 867	w	unassigned

OTHER REMARKS:

1191 - 1039 cm^{-1} aromatic fingerprint region.
Sample predominantly aromatic acids and phenolic derivatives.

TABLE 8-165.
IR REPORT

SAMPLE: 11A-C, tar decanter vapor, condensate extract pH 2: concentrate IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3590, 3475	s	alcoholic or phenolic free OH
3500 - 2800	(2 broad bands)	alcoholic or phenolic OH H-bonded
3060 - 3040, 3005	m,s	aromatic or conj. olefinic CH stretch
2975, 2960,	m	aliphatic CH stretch
2880		
1620, 1595,	m,s	aromatic C$\overset{\cdots}{-}$C
1510, 1500		
1455, 1375	s,w	aliphatic CH bend
1285-1200	m - w	aromatic fingerprint region
1150	s	alcoholic or phenolic C-O
830 - 750	broad	alcoholic or phenolic OH bend, substituted
		aromatic CH bend
1410, 1345,	w	unassigned
1315, 1120,		
1035, 1000,		
930		

OTHER REMARKS:

Sample appears to contain predominantly alcohols and alkylated phenols. Broad, unresolved band at 1595 cm^{-1} strongly suggest that considerable phenolic compounds are present.

TABLE 8-166.
IR REPORT

SAMPLE: 11A-LC1, tar decanter vapor, condensate extract pH 2: LC cut #1 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
2959	s	aliphatic CH stretch
2925, 2856	s	aliphatic CH stretch
1465	m	aliphatic CH bend
1376, 1274	w	unassigned

OTHER REMARKS:
2340 and 2370 cm^{-1} due to CO_2.
Only saturated hydrocarbons.

TABLE 8-167.
IR REPORT

SAMPLE: 11A-LC2, tar decanter vapor, condensate extract pH 2: LC cut #2 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3044	w	aromatic CH stretch
2960 - 2900	w	aliphatic CH stretch
1602	w	aromatic C$\overset{\cdots}{-}$C
1445	w	aliphatic CH bend
815, 732	s	substituted aromatic CH bend
1623, 1026, 951, 890, 712	w	unassigned

OTHER REMARKS:

Sample predominantly aromatic.

TABLE 8-168.
IR REPORT

SAMPLE: 11A-LC3, tar decanter vapor, condensate extract pH 2: LC cut #3 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3048	w	aromatic or olefinic CH stretch
2952 - 2850	w	aliphatic CH stretch
1925 - 1602	w	aromatic combination/overtone
1445	m	aromatic or olefinic
1246 - 951	w	fingerprint region-aromatic
814, 732	s	substituted aromatic C-H bend
1396, 1301, 883,	w	unassigned
869, 712, 698		

OTHER REMARKS:

Sample contained only traces of saturated hydrocarbons - almost entirely aromatic and/or unsaturated hydrocarbons.

TABLE 8-169.
IR REPORT

SAMPLE: 11A-LC4, tar decanter vapor, condensate extract pH 2: LC cut #4 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3423	s	alcoholic or phenolic OH, H-bonded
3047	w	aromatic or olefinic CH stretch
2924, 2854	m	aliphatic CH stretch
1703	w	ketone, ester
1603, 1497	m,w	aromatic $C\overset{\cdots}{-}C$
1450	s	aliphatic CH bend
1239, 1886,	m,w,m	alcohol, phenol, ester or aromatic acid.
1010		
822, 775, 746,	m,s,s,s,w	substituted aromatic CH
722, 698		
1656, 1627,	w	unassigned
1339, 1263,		
1203, 928		

OTHER REMARKS:

Sample contains predominantly phenolic compounds, and some aliphatic esters of aromatic acids.

This sample possessed less mass than that required by the Level 1 criteria for IR analysis. A spectrum of acceptable quality was obtained by using Fourier Transform IR techniques.

TABLE 8-170.
IR REPORT

SAMPLE: 11A-LC5, tar decanter vapor, condensate extract pH 2: LC cut #5 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3425	s	phenolic or alcoholic OH
3055	w	aromatic or olefinic CH
2959, 2931,	s	aliphatic CH
2863		
1726	s	ketone or ester
1452	s	aliphatic CH bend
1280, 1133	s,m	phenol, alcohol, ester or ether
1075, 1006	m	phenol, alcohol, ester or ether
746, 725	s	substituted aromatic CH (suggestive of
		monosubstituted benzene-phenol?)

OTHER REMARKS:

Probable alkylated phenols, diaphatic esters of aromatic acids, ethers, alcohols.

TABLE 8-171.
IR REPORT

SAMPLE: 11A-LC6, tar decanter vapor, condensate extract pH 2: LC cut #6 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3300 - 2500	s	carboxylic acid or phenolic derivatives
2959, 2931,	s	aliphatic CH stretch
2863		
1596, 1506	s	C$\overset{\cdots}{-}$C ring stretches
1465, 1376	s,m	aliphatic CH bend
1376	m	phenolic OH bend
1246	s	phenolic C-O stretch
1000 - 1200	w - m	aromatic fingerprint region
691 - 807	m - s	substituted aromatic CH
1924, 1623,	w	unassigned
1314, 951,		
931, 623		

OTHER REMARKS:

Probable alkylated phenols.

TABLE 8-172.
IR REPORT

SAMPLE: 11A-LC7, tar decanter vapor, condensate extract pH 2: LC cut #7 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
1956, 2929,	s	aliphatic CH stretch
2856		
2064	m	isothiocyanate
1731, 1711	s	ketone, ester
1597, 1484	s,m	aromatic or conj. olefinic $\mathrm{C}\overset{\cdots}{-}\mathrm{C}$
1465	m	aliphatic CH bend
1278	s	ester, ether
1125, 1072	w	ester, ether
746	m	alkene, substituted aromatic CH bend
1551, 1451	w	unassigned

OTHER REMARKS:

This sample possessed less mass than that required by Level 1 criteria for IR analysis. A spectrum of acceptable quality was obtained by using Fourier Transform IR techniques.

Probable aliphatic esters of aromatic acids.

TABLE 8-173.
IR REPORT

SAMPLE: 11B-P, tar decanter vapor, condensate extract pH 12: preliminary IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3500 - 3200	w(broad)	amine or amide NH, H-bonded
2954, 2930,	s	aliphatic CH stretch
2859		
1743, 1732	m	ester, or possibly aliphatic ketone
1701	w	amide I band of 1° amides, ketone, ester
1462, 1380	m,w	aliphatic CH bend
1262 - 1074	w	amino C-N stretch, esters of aromatic acids,
		aromatic and/or aliphatic ethers
799, 740	w	amine or amide NH bend, sub. aromatic NH bend

OTHER REMARKS:

Sample predominantly aliphatic ketones, and aryl alkyl amines and/or amides. May contain some esters of aromatic acids.

TABLE 8-174.
IR REPORT

SAMPLE: 11B-C, tar decanter vapor, condensate extract pH 12: concentrate IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3545, 3585	s,w	alcoholic OH stretch
3500 - 3100	s→m(broad)	amines or amides NH stretch
3050-3030, 3006	s	aromatic CH stretch
2980, 2920,	m,m,w	aliphatic CH stretch
2865		
2064	m	isothiocyanate (-N=C=S)
1720	m	aliphatic ketones or esters
1660, 1620,	s	1° amines, amide I (>C=O) and amide II
1590, 1580		(NH bend) bands, or aromatic C$\overset{\cdots}{-}$C
1455, 1375	s,w	aliphatic CH bend
1410	m	1° amide C-N stretch
1265, 1255,	m,m,s→m	esters of aromatic acids, C-N stretch of 1°, 2°,
1155 - 1090		and/or 3° amines and 2° amides or alcoholic C-O
830 - 730	m	amines and 1° amide NH wag or substituted aromatic
		CH bend
2560, 2400,	w	unassigned
1500, 1480,		
1010, 840		

OTHER REMARKS:

Sample appears to contain predominantly aryl and alkyl amines or amides. The broad unresolved peak about 1600 cm^{-1} is typical of monosubstituted benzene, suggesting the presence of aniline and N-alkylated derivatives.

TABLE 8-175.
IR REPORT

SAMPLE: 11B-LC1, tar decanter vapor, condensate extract pH 12: LC cut #1 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
2959	s	aliphatic CH stretch
2925, 2856	s	aliphatic CH stretch
1465	m	aliphatic CH bend
1739, 1376,	w	unassigned
1287		

OTHER REMARKS:

2340 and 2370 cm^{-1} due to CO_2.
Only saturated hydrocarbons present.

TABLE 8-176.
IR REPORT

SAMPLE: 11B-LC2, tar decanter vapor, condensate extract pH 12: LC cut #2 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3053	w	aromatic or olefinic CH stretch
2951, 2931,	m,s,m	aliphatic CH stretch
2846		
1570, 1472	w,m	aromatic $\mathrm{C}\overset{\cdots}{-}\mathrm{C}$
1450	m	aliphatic CH bend
872	w	isolated aromatic CH bend
810, 739, 692	m,s,s	substituted aromatic CH bend
1014	w	unassigned

OTHER REMARKS:

This sample possessed less mass than that required by the Level 1 criteria for IR analysis. A spectrum of acceptable quality was obtained by using Fourier Transform IR techniques.

Sample contained saturated and unsaturated or aromatic hydrocarbons.

TABLE 8-177.
IR REPORT

SAMPLE: 11B-LC3, tar decanter vapor, condensate extract pH 12: LC cut #3 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3056, 3044,	w	aromatic or olefinic CH stretch
3017		
2950, 2923,	s	aliphatic CH stretch
2855		
1730	m	aliphatic ketone or ester
1600, 1583,	w,w,w,m	aromatic $C\overset{\cdots}{-}C$ stretch
1492, 1477		
1462, 1459,	m	aliphatic CH bend
1442		
1374, 1365	w	methyl CH bend, possibly gem-dimethyl
1263, 1092,	m - s	ester of aromatic acid or aromatic
1064, 1025		or aliphatic ether
822, 813, 799,	m,s,m,s	substituted aromatic isolated H
778, 737		substituted aromatic CH bend
1201, 1177, 699	w	unassigned

OTHER REMARKS:

This sample possessed less mass than that required by the Level 1 criteria for IR analysis. A spectrum of acceptable quality was obtained by using Fourier Transform IR techniques.

Sample appears to contain predominantly aromatic compounds and ester of aromatic acids or aryl ethers.

TABLE 8-178.

IR REPORT

SAMPLE: 11B-LC4, tar decanter vapor, condensate extract pH 12: LC cut #4 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3411	s	2° amine or amide NH stretch
3062	w	aromatic CH stretch
2959, 2931,	s	aliphatic CH stretch
2856		
1718	m	ketone, formate or conjugated ester or amide
1459	m	aliphatic CH or amide C-N
1280, 1239	m	amide or aryl alkyl ether
1095, 1013	m	ester, ether
739	s	substituted benzene
691	m	substituted benzene
1342, 1123,	w	unassigned
1075, 808		

OTHER REMARKS:

IR spectrum suggests sample contains appreciable amounts of aromatic and aliphatic 2° amines. Lack of strong absorption at 1718 cm^{-1} suggests that absorption at 3411 cm^{-1} due to 2° amine not amide.

TABLE 8-179.
IR REPORT

SAMPLE: 11B-LC5, tar decanter vapor, condensate extract pH 12: LC cut #5 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3391	m	2° amine or 2° amide
3055	w	aromatic or olefinic CH
2959, 2911,	s	aliphatic CH
2863		
1726	s	ketone or ester
1602, 1581	w	aromatic $C\overset{\cdots}{-}C$
1465, 1388	m,w	aliphatic CH, methyl CH bend
1280, 1123	s,m	aliphatic ester of aromatic acid
1075, 952	m,w	aromatic fingerprint region
734, 691	s,w	substituted benzene, probably
		ortho-disubstituted
1581 (probably	w	unassigned
>N-H bending),		
1410, 1239,		
952, 780		

OTHER REMARKS:

Carboryl absorption too high for amide, and lack of doublet in region 3400-3100 cm^{-1} leads to conclusion that compounds are secondary amino derivatives. Sample contains aryl and alkyl 2° amines and aryl and/or alkyl esters.

TABLE 8-180.
IR REPORT

SAMPLE: 11B-LC6, tar decanter vapor, condensate extract pH 12: LC cut #6 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3329	m(broad)	alcoholic OH or amide or amine NH
3150, 3068	s	aromatic or olefinic CH stretch
2954, 2931, 2863	s	aliphatic CH stretch
2068	w	isothiocyanate or ketenimine
1725	m	ester and/or aliphatic ketone
1610, 1595, 1506	s	aromatic C$\overset{\cdots}{-}$C and/or amine or amide NH bend
1459, 1390	s,m	aliphatic CH bend
1287 - 1246	s	ester of aromatic acid, aryl ether of C-N stretch of aryl or alkyl amines
944, 849, 807 - 691	w,w,m	sharp bands in aromatic fingerprint region, substituted aromatic CH bend
2733, 2698, 2575, 1321	w	unassigned

OTHER REMARKS:

Sample predominantly alkylated derivatives of aniline or polynuclear aromatic amine, and saturated ketones. The lack of a broad band in region 1250-100 cm^{-1} corresponding to an ethercal or alcoholic C-O stretch suggests that the sharp, strong band in this region is likely due to C-N stretch of amines.

TABLE 8-181.
IR REPORT

SAMPLE: 11B-LC7, tar decanter vapor, condensate extract pH 12: LC cut #7 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
2954, 2931,	s	aliphatic CH stretch
2856		
2061	m	isothiocyanate or ketenimine
1732	s	ester or aliphatic ketone
1465	m	aliphatic CH bend
1240	s	ester of aromatic acid, aromatic ether
1122, 1074	w	ether, ester of aromatic acid
739	m	aromatic
1664, 1602,	w	unassigned
1581, 1383,		
759, 691		

OTHER REMARKS:
Probable aliphatic esters of aromatic acids.

TABLE 8-182.
IR REPORT

SAMPLE: 5X-P, vapor above chemical oil tank, XAD-2 resin: preliminary IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3069, 3055, 3007	w,m,w	aromatic CH stretch
2959, 2932, 2856	w	aliphatic CH stretch
1950, 1924, 1842, 1732	w	aromatic combinations/overtones
1596, 1506	m	aromatic C$\overset{\cdots}{-}$C
1390, 1363	m	highly sub. aromatic or gem-dimethyl CH bend
1274, 1173, 1123	w	aromatic or aliphatic ethers
958	m	
841, 780, 648	w,s,w	substituted aromatic CH bend
1671, 1568, 1246, 1006, 616	w	unassigned

OTHER REMARKS:

Sample appears to contain predominant aromatic hydrocarbons and methylated and/or other derivatives.

TABLE 8-183.

IR REPORT

SAMPLE: 5X-C, vapor above chemical oil tank, XAD-2 resin: concentrate IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3068, 3051,	w,m,w	aromatic or olefinic CH
3004		
2952 - 2850	w	aliphatic CH stretch
1957 - 1671	w	aromatic overtones/combinations
1596, 1508	m,w	aromatic $C\overset{\cdots}{-}C$
1392	m	highly substituted aromatics
961, 780, 746	m,s,m,m	substituted aromatic cmpds
2298, 1270,	w	unassigned
1124, 1008,		
845, 816		

OTHER REMARKS:

Sample comprised almost entirely of aromatic hydrocarbons with very few saturated or oxygen-containing cmpds present.

TABLE 8-184.
IR REPORT

SAMPLE: 5X-LC1, vapor above chemical oil tank, XAD-2 resin: LC cut #1 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
2960, 2926,	s	aliphatic C-H stretch
2858		
1462	m	aliphatic CH bend
1377	w	isolated methyl CH bend
1746, 1604	w	unassigned

OTHER REMARKS:

Sample contains predominantly saturated hydrocarbons.

TABLE 8-185.
IR REPORT

SAMPLE: 5X-LC2, vapor above chemical oil tank, XAD-2 resin: LC cut #2 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
2959, 2926,	m,s,m	aliphatic CH stretch
2856		
1462, 1452	w	aliphatic CH bend
1380	w	methyl CH bend
1262	s	aromatic ether
1098, 1040	s	aromatic and/or aliphatic ether
802	s	substituted aromatic CH bend
863, 750, 701	w	unassigned

OTHER REMARKS:

This sample possessed less mass than that required by the Level 1 criteria for IR analysis. A spectrum of acceptable quality was obtained by using Fourier Transform IR techniques.

Sample predominantly aliphatic and aromatic ethers. Absorption bands in CH out-of-plane bending region for aromatics suggests that para-substituted benzene is predominant but some monosub. benzene is present.

TABLE 8-186.
IR REPORT

SAMPLE: 5X-LC3, vapor above chemical oil tank, XAD-2 resin: LC cut #3 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
2965, 2930,	s	aliphatic CH stretch
2859		
1738	w	ester or aliphatic ketone
1462, 1380	m,w	aliphatic CH bend
1263	s	aromatic ether or ester of aromatic acid
1098, 1039	s	aromatic and/or aliphatic ethers or alkanes
869, 805, 699	w,s,w	substituted aromatic
1656, 670	w	unassigned

OTHER REMARKS:

Sample seems to consist primarily of vinyl or aromatic ethers, and a small amount of aromatic or aliphatic esters.

TABLE 8-187.
IR REPORT

SAMPLE: 5X-LC4, vapor above chemical oil tank, XAD-2 resin: LC cut #4 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
2960, 2920,	s	aliphatic CH stretch
2850		
1706	w	ketone or ester
1593	w	aromatic C$\overset{\cdots}{-}$C
1460, 1375	w	aliphatic CH bend
1020	w	aliphatic ester or ether
726	w	substituted aromatic CH bend

OTHER REMARKS:

This sample possessed less mass than that required by the Level 1 criteria for IR analysis. A spectrum of acceptable quality was obtained by using Fourier Transform IR techniques.

Sample appears to contain predominantly saturated hydrocarbons and a trace amount of aromatic compounds.

TABLE 8-188.
IR REPORT

SAMPLE: 5X-LC5, vapor above chemical oil tank, XAD-2 resin; LC cut #5 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
2959, 2924,	s	aliphatic CH stretch
2859		
1726	m	ketone or ester
1468, 1450	m,w	aliphatic CH bend
1380	w	isolated methyl CH bend
1286, 1130	m,w	aliphatic or aromatic ester or ether
740	w	substituted aromatic CH bend
1661, 1632,	w	unassigned
1603, 1074		

OTHER REMARKS:

Sample predominantly saturated hydrocarbons and aliphatic esters. Bands in region 1660-1600 and at 1074 and 740 cm^{-1} suggest presence of aromatic cmpds, possibly alkylated derivatives or aromatic esters.

TABLE 8-189.
IR REPORT

SAMPLE: 5X-LC6, vapor above chemical oil tank, XAD-2 resin; LC cut #6 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3063	w	aromatic or olefinic CH
2956, 2927,	s	aliphatic CH stretch
2856		
1727	s	ketone or ester
1603, 1460	m	aromatic $C\overset{\cdots}{-}C$
1454, 1380	m,w	aliphatic CH bend
1280, 1125	m,w	ester of aromatic acid or aromatic
		and/or aliphatic ether
748, 694	m,w	substituted aromatic CH bend
1075, 1040, 618	w	unassigned

OTHER REMARKS:

Sample predominantly aromatic esters of 1° alcohols (i.e., benzoates, etc.)

TABLE 8-190.
IR REPORT

SAMPLE: 5X-LC7, vapor above chemical oil tank, XAD-2 resin: LC cut #7 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
2964, 2962,	s	aliphatic CH stretch
2859		
1738	m	ester or aliphatic ketone
1562	m	aromatic C⋯C stretch
1456	m	aliphatic CH bend
1286, 1268,	w	esters of aromatic acids or aromatic
1122		or aliphatic ethers
740	w	substituted aromatic CH bend
1074, 669	w	unassigned

OTHER REMARKS:

This sample possessed less mass than that required by the Level 1 criteria for IR analysis. A spectrum of acceptable quality was obtained by using Fourier Transform IR techniques.

Sample predominantly saturated ethers or saturated ethers and/or esters of aromatic acids.

TABLE 8-191.
IR REPORT

SAMPLE: 5XR-P, vapor above chemical oil tank, canister rinse: Preliminary IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3085, 3045, 3010	s	aromatic CH stretch
2960, 2950, 2920	w	aliphatic CH stretch
1950-1650	w	aromatic overtones and combinations
1595, 1500	s	aliphatic $C\overset{\cdots}{-}C$ stretch
1390, 1360	s,w	gem-dimethyl CH bend or highly substituted aromatic cmpds.
1270-960	s (sharp)	aromatic fingerprint region
840-770	m (broad)	substituted aromatic CH bend
725	w	substituted aromatic CH bend
620	w	unassigned

OTHER REMARKS:

Sample predominantly aromatic hydrocarbons. Bands at 1390, 1360 and 840-770 cm^{-1} strongly suggest that alkylated derivatives are i-propyl or t-butyl α- and β-substituted naphthalenes.

TABLE 8-192.
IR REPORT

SAMPLE: 5XR-C, vapor above chemical oil tank, canister rinse: Concentrate IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3090, 3060-3000	s	aromatic CH stretch
2980, 2960, 2870	m,w	aliphatic CH stretch
1945-1665	m	aromatic overtones/combinations
1598, 1555, 1500	s,w,s	aromatic C$\overset{\cdots}{-}$C stretch
1450	w	aliphatic CH bend
1390, 1360	s	gem-dimethyl or t-butyl CH
1270-960	s (sharp)	aromatic fingerprint region
825, 720	s,m	sub. aromatic CH bend
2290	w	unassigned - (nitrile?)

OTHER REMARKS:

Sample contains primarily aromatic hydrocarbons and alkylated derivates. Bands at 1390, 1360, 825 and 720 cm^{-1} strongly suggest that these alkylated derivatives are almost entirely i-propyl or t-butyl derivatives of α- and β-sub. naphthalenes.

TABLE 8-193.
IR REPORT

SAMPLE: 5XR-LC1, vapor above chemical oil tank, canister rinse: LC cut #1 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
2959, 2925, 2856	s	aliphatic CH
1733	m	ester or aliphatic ketone
1457	m	aliphatic CH
1376	w	methyl C-H
1123, 1075	w	ester or ether C-O
739	w	$-(CH_2)_n-$, $n \geq 4$ rocking or substituted aromatic
1718, 1280, 1274		CH bend
1718, 1280, 1274	w	unassigned

OTHER REMARKS:

Bands at 1733, 1123 and 1075 cm^{-1} very likely due to esters that are present. Bands at 1280, 1274 and 739 cm^{-1} possible due to aromatic ether. Sample appears to consist predominantly of saturated hydrocarbons and/or aliphatic esters or ketones.

TABLE 8-194.
IR REPORT

SAMPLE: 5XR-LC2, vapor above chemical oil tank, canister rinse: LC cut #2 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3050	w	aromatic CH stretch
1956-1785	w	aromatic combination and overtone region
1593, 1505	w	aromatic C$\overset{\cdots}{-}$C stretch
842	w	substituted aromatic CH bend
780 S	w	substituted aromatic CH bend
1391, 1272, 1210, 1127, 1008,	w	unassigned
961	m	unassigned

OTHER REMARKS:

Bands in region 1956-1785 cm^{-1} and single bands at 842 and 780 cm^{-1} highly suggestive of meta- or ortho-disubstituted benzene, i.e., 3 or 4 adjacent hydrogen atoms. Sample is primarily aromatic hydrocarbons, containing few aliphatic hydrocarbons. This sample probably contains significant amounts of naphthalene.

TABLE 8-195.
IR REPORT

SAMPLE: 5XR-LC3, vapor above chemical oil tank, canister rinse: LC Cut #3 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
2959, 2952, 2856	s	aliphatic CH stretch
1733	s	esters or aliphatic ketones
1459, 1376	m,w	aliphatic CH bend
1274, 1123, 1075	m,w,w	aromatic ester of 1° and 2° alcohols or aromatic or
		aliphatic ethers
808, 746	w	substituted aromatic CH bend
1541, 1034	w	unassigned

OTHER REMARKS:

This sample possessed less mass than that required by the Level 1 criteria for IR analysis. A spectrum of acceptable quality was obtained by using Fourier Transform IR techniques.

This sample appears to be predominantly aromatic esters of 1° and/or 2° alcohols.

TABLE 8-196.
IR REPORT

SAMPLE: 5XR-LC4, vapor above chemical oil tank, canister rinse: LC cut #4 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
2962, 2931, 2874,		
2861	s	aliphatic CH stretch
1733	s	ester or aliphatic ketone
1462, 1381	m	aliphatic CH bend
1292, 1273	s	aromatic ether or ester of aromatic acid
1122, 1071	m	aromatic or aliphatic ether or ester of aromatic
		acid
744, 700	m,w	substituted aromatic CH bend
945, 669	w	unassigned

OTHER REMARKS:

This sample possessed less mass than that required by the Level 1 criteria for IR analysis. A spectrum of acceptable quality was obtained by using Fourier Transform IR techniques.

Sample appeared to contain predominantly saturated hydrocarbons and aliphatic esters of aromatic acids.

TABLE 8-197.
IR REPORT

SAMPLE: vapor above chemical oil tank, canister rinse: LC cut #5 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
2963, 2931, 2878	s	aliphatic CH
1731	s	ester or aliphatic ketone
1488, 1456	m	aliphatic CH bend
1377	w	methyl CH bend
1280, 1123	s,m	aromatic or aliphatic esters or ethers
1076	m	ester or ether
743, 700	m,w	$-(CH_2)_n-$, $n \geq 4$ rocking or substituted aromatic CH bend
1440, 1224, 1038	w	unassigned

OTHER REMARKS:

Sample predominantly aliphatic esters of aromatic and aliphatic acids or aliphatic ethers.

TABLE 8-198.
IR REPORT

SAMPLE: 5XR-LC6, vapor above chemical oil tank, canister rinse: LC cut #6 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3335	m (broad)	alcoholic or phenolic OH or amide
3068	w	aromatic CH stretch
2959, 2931, 2856	s	aliphatic CH stretch
1732	s	ester or aliphatic ketone
1684	m	ketone or amide
1602	m	aromatic C$\overset{\cdots}{-}$C stretch
1465	m	aliphatic CH bend
1383, 1273	m	alcohol, phenol or aromatic ether or amide CN stretch
746	w	substituted aromatic CH bend
1224, 1129, 1074, 1026, 965, 821, 698, 615	w	unassigned

OTHER REMARKS:

Sample consists predominantly of aliphatic alcohols, amides or esters or alkylated derivatives of phenol.

TABLE 8-199.
IR REPORT

SAMPLE: 5XR-LC7, vapor above chemical oil tank, canister rinse: LC cut #7 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
2959, 2932,		
2856	s	aliphatic CH stretch
1739	s	ester or aliphatic
1459	m	aliphatic
1264, 1164,		
1075	w	ester or ether
1678, 1602,		
1561, 1376,		
821, 739, 698	w	unassigned

OTHER REMARKS:

TABLE 8-200.
IR REPORT

SAMPLE: 7X-P, upwind ambient, XAD-2 resin: preliminary IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
2966, 2932,		
2858	s	aliphatic CH stretch
1740, 1729	s	ester and/or aliphatic ketone
1451, 1377	m,w	aliphatic CH bend
1266, 1166,		
1099	s	ester or aromatic ether
1076, 1029	m	aromatic fingerprint region
798, 713	m	substituted aromatic
1604	w	unassigned

OTHER REMARKS:

This sample possessed less mass than that required by the Level 1 criteria for IR analysis. A spectrum of acceptable quality was obtained by using Fourier Transform IR techniques.

Sample predominantly aliphatic esters of aromatic acids.

TABLE 8-201.
IR REPORT

SAMPLE: 7X-C, upwind ambient, XAD-2 resin: concentrate IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3065, 3032	w	aromatic or olefinic CH stretch
2966, 2928, 2873, 2862	s	aliphatic CH stretch
1727	m	saturated ketone or ester
1705	m	aryl ketone or ester
1607, 1492	m	aromatic C⋯C stretch
1453, 1376	m	aliphatic CH bend
1261, 1113	m,w	ester of aromatic acid, aromatic or aliphatic ether
801, 757, 708, 702	m	substituted aromatic CH bend
1316, 1179, 1097, 1069, 1026	w	unassigned

OTHER REMARKS:

Sample contains predominantly alkylated aromatic esters (e.g. benzoates), saturated and aromatic hydrocarbons and possibly some saturated ketones and/or esters.

TABLE 8-202.
IR REPORT

SAMPLE: 7X-LC1, upwind ambient, XAD-2 resin: LC cut #1 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
2959, 2924,		
2856	s	aliphatic CH stretch
1458	m	aliphatic CH bend
1376	w	isolated methyl CH bend
752, 698	w	mono-substituted benzene
1746, 1610	w	unassigned

OTHER REMARKS:

Sample predominantly saturated hydrocarbons. However, bend @ 1746 suggests presence of small amounts of aliphatic ketones or esters, and bends at 1610, 752 and 698 cm^{-1} suggest presence of small amounts of substituted benzene.

TABLE 8-203.
IR REPORT

SAMPLE: 7X-LC2, upwind ambient, XAD-2 resin: LC cut #2 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3065, 3030	m	aromatic or olefinic CH
2965, 2924, 2871	s	aliphatic CH stretch
1601, 1492	w,m	aromatic $\mathrm{C}\overset{\cdots}{-}\mathrm{C}$
1456	m	aliphatic CH bend
1374	w	isolated methyl CH bend
752, 699	m,s	substituted aromatic CH bend
1515, 1263, 1029, 887, 834	w	unassigned

OTHER REMARKS:

Bands in C-H out-of-plane bending region for aromatics. Characteristic of mono-substituted benzene.

Sample contains only aliphatic and aromatic hydrocarbons.

TABLE 8-204.
IR REPORT

SAMPLE: 7X-LC3, upwind ambient, XAD-2 resin: LC cut #3 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3084, 3062, 3026, 3001	m	aromatic or olefinic CH
2965, 2925, 2871, 2856	s	aliphatic CH stretch
1591, 1515	w	aromatic C$\overset{\cdots}{-}$C ring mode
1494, 1453	m	aliphatic CH bend
1374	w	isolated methyl CH bend
890, 833, 778, 754	w,m,m,s	substituted aromatic
1729, 1263, 1098, 1031	w	unassigned

OTHER REMARKS:

Sample predominantly aliphatic and aromatic hydrocarbons with a trace of ketone or ester as evidenced by very weak absorption at 1728 cm^{-1}.

TABLE 8-205.
IR REPORT

SAMPLE: 7X-LC4, upwind ambient, XAD-2 resin: LC cut #4 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3063	w	aromatic or olefinic CH stretch
2959, 2929, 2856	s	aliphatic CH stretch
1738, 1729	s	ester or aliphatic ketone
1603, 1494, 1465	w	aromatic C$\overset{\cdots}{-}$C stretch
1453, 1380	m,w	aliphatic CH bending
1265, 1116	s,m	ester of aromatic acid, aromatic or aliphatic ether
794, 754, 708	w,w,s	substituted aromatic CH bend
1662, 1588, 1380, 1315, 1177, 1098, 1069, 1025	w	unassigned

OTHER REMARKS:

Bands at 1098, 1069, 1025, 754, and 708 cm^{-1}. Suggestive of monosubstituted benzene.

Sample predominantly aromatic esters of considerable aliphatic character.

TABLE 8-206.
IR REPORT

SAMPLE: 7X-LC5, upwind ambient, XAD-2 resin: LC cut #5 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3020	w	aromatic or olefinic CH
2959, 2926,		
2856	s	aliphatic CH stretch
1725	s	ester or aliphatic ketone
1602, 1584	w	aromatic C$\overset{\cdots}{-}$C
1462, 1454	m	aliphatic CH bend
1380	w	methyl CH bend
1273, 1122	s,m	aliphatic or aromatic C-O
798, 742, 710	w,w,s	substituted aromatic
1175, 1071		
1026	w	unassigned

OTHER REMARKS:

Sample predominantly aliphatic and/or aryl esters. Bands for $>C=O$ and C-O frequencies are highly suggestive or aromatic esters.

TABLE 8-207.
IR REPORT

SAMPLE: 7X-LC6, upwind ambient, XAD-2 resin: LC cut #6 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3065, 3036	w	aromatic or aliphatic CH
1726	s	ester or aliphatic ketone
1603, 1585	m,w	aromatic or olefinic $C\overset{\cdots}{-}C$
1456	m	aliphatic CH bend
1380	w	methyl CH bend
1274, 1116	s,m	aromatic or aliphatic ether or ester or aromatic acid
758, 711	m,s	substituted aromatic CH bend
1515, 1174, 1069, 1028, 981	w	unassigned

OTHER REMARKS:

Broad band at 3341 cm^{-1} due to H_2O in cell.

Sample composed primarily of aliphatic esters of aromatic acids with band at 758 and 741 cm^{-1} being characteristic of mono-sub. benzene.

TABLE 8-208.
IR REPORT

SAMPLE: 7X-LC7, upwind ambient, XAD-2 resin: LC cut #7 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
2965, 2930,		
2859	s	aliphatic CH stretch
1726	s	ester or aliphatic ketone
1603	m	olefinic or aromatic C$\overset{\cdots}{-}$C
1450	m	aliphatic CH bend
1403	m	olefinic CH bend
1374	m	methyl CH bend
1274, 1109	m,s	aromatic ester or aromatic ether and aliphatic
		ester
716		olefinic C-H bend
1556, 1027,		
940	w	unassigned

OTHER REMARKS:

Spectrum indicates sample is predominantly unsaturated esters, such as acrylates, maleates, etc. Bands at 1603, 1403 and 716 cm^{-1} suggests that vinyl group is cis-disubstituted.

TABLE 8-209.
IR REPORT

SAMPLE: 6X-P, downwind ambient, XAD-2 resin: preliminary IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
2972-2856	m	aliphatic CH stretch
1726	w	ketone or ester
1602		conj. olefine and/or aromatic $C\overset{\cdots}{-}C$
1445	w	aliphatic CH bend
1260	w	ester of aromatic acid
794	s	substituted aromatic cmpds
699	s	substituted aromatic cmpds
1089, 1020, 986	w	unassigned

OTHER REMARKS:

This sample possessed less mass than that required by the Level 1 criteria for IR analysis. A spectrum of acceptable quality was obtained by using Fourier Transform IR technology.

Sample contains some saturated hydrocarbons and aromatic esters. Two sharp bands at 794 and 699 cm^{-1} suggest that aromatic compounds are substituted such that 1, 3 and 5 adjacent hydrogens are present.

TABLE 8-210.
IR REPORT

SAMPLE: 7XR-C, upwind ambient, canister rinse: concentrate IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3030	w	aromatic CH stretch
2950, 2930, 2855	s	aliphatic CH stretch
1725, 1715	s	aliphatic ketone or ester
1600, 1575	w	aromatic C$\overset{\cdots}{-}$C stretch
1460, 1380	s,m	aliphatic CH bend
1295, 1280	s	ester of aromatic or α,β-unsaturated acids or aromatic ethers
1130, 1075	s	ester of aromatic or α,β-unsaturated acids, aromatic or aliphatic ethers
1650, 820-760	w	unassigned

OTHER REMARKS:

This sample contains predominantly saturated and aromatic compounds. Spectrum also indicates that sample contains aliphatic esters of aromatic acids and saturated ethers.

TABLE 8-211.
IR REPORT

SAMPLE: 6X-C, downwind ambient, XAD-2 resin: concentrate IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3063	w	aromatic or olefinic CH stretch
2963, 2926, 2856	s	aliphatic CH stretch
1731	s	ester or aliphatic ketone
1604, 1463	w,m	aromatic $\mathrm{C}\overset{\cdots}{-}\mathrm{C}$
1455, 1377	m,w	aliphatic CH bend
1262, 1095, 1020	s	ester of aromatic acid
801, 711	s,m	substituted aromatic CH bend
1586, 1176, 864, 749	w	unassigned

OTHER REMARKS:

Sample contains aromatic and aliphatic esters or ethers and possibly some aliphatic ketones.

TABLE 8-212.
IR REPORT

SAMPLE: 6XR-C, 16XAD can rinse #6, downwind ambient, canister rinse: concentrate IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
2962-2858	s	aliphatic CH
1729	s	ester or aliphatic ketone
1599-1584	w	aromatic $C\overset{\cdots}{-}C$
1465	m	aliphatic CH bend
1378	w	methyl CH bend
1288, 1273	m,s	ester of aromatic acid or aromatic ether
1123, 1071	m	aromatic ester or aromatic or aliphatic ether
739	m	substituted aromatic CH bend
1071, 1066, 962, 812	w	unassigned

OTHER REMARKS:

Bands at 2366 and 2340 cm^{-1} due to CO_2.

Bands at 677 cm^{-1} due to residual methylene chloride on salt plate.

Bands at 1288 and 1273 cm^{-1} highly suggestive of an ester of aromatic acid.

Sample is predominantly aliphatic esters of aromatic acids, or possibly aromatic and/or aliphatic ethers.

TABLE 8-213.
IR REPORT

SAMPLE: 12P biological sludge; biological treatment plant sludge, pH 7 extract: preliminary IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3058	w	aromatic CH or olefinic CH
2960-2930	s	aliphatic CH
2857	s	aliphatic and/or aldehydic CH
1709	w	ketone, ester, aldehyde
1642-1550	m	aromatic or olefinic C=C
1465	m	aliphatic CH (methylene) or aromatic C=C
1380	w	aliphatic CH (methylene) or α-naphthalene
1282-1240	w	aromatic ether or ester C-O
752	w	aromatic CH
831, 787, 697	w	unassigned

OTHER REMARKS:

Inverted bands at 2370-2340 cm^{-1} due to CO_2. Bands around 700-850 cm^{-1} suggestive of 3-, 4-, and 5- adjacent aromatic CH.

TABLE 8-214.
IR REPORT

SAMPLE: 12-C biological treatment plant sludge, pH 7 extract: concentrate IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3055	w	aromatic CH
2959-2856	s	aliphatic and aldehydic CH
1712	m	ketone, ester
1657	m	olefine (conj.) or aromatic C=C
1595	m	aromatic ring (C=C)
1458	m	aliphatic or aromatic CH
1376	m	aliphatic CH (methyl)
1273-1239	w	aromatic ether, or ester
752	m	$(-CH_2-)$ rocking for $n>4$ or aromatic CH
821, 787, 691	w	unassigned

OTHER REMARKS:

Bands at 2363 and 2342 cm^{-1} are due to presence of CO_2 in cell, inadequate purging.

Probable compounds and alkylated derivatives.

TABLE 8-215.
IR REPORT

SAMPLE: 12-LC1, biological treatment plant sludge, pH 7 extract LC cut #1 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
2959, 2927,		
2857	s	aliphatic CH stretch
1463	m	aliphatic CH methyl and methylene
1377	w	aliphatic C-C methyl
720, 677	w	aromatic CH bend
2724, 1150	w	unassigned

OTHER REMARKS:

Bands at 2363 and 2342 cm^{-1} due to CO_2. Band at 676 cm^{-1} likely due to residual CH_2Cl_2 left on plate.

Probable saturated hydrocarbons, with trace amounts of aromatic compounds.

TABLE 8-216.
IR REPORT

SAMPLE: 12-LC2, biological treatment plant sludge, pH 7 extract: LC cut #2 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3013	w	aromatic or olefinic CH
2959-2863	s	aliphatic CH
1602	w	aromatic C-C
1458	m	aliphatic C-H bend
1376	m	methyl CH bend
814, 746	w	substituted aromatic

OTHER REMARKS:

Bands at 2365 and 2340 cm^{-1} due to CO_2. Splitting pattern at 846, 814 and 746 cm^{-1} highly suggestive of meta-substituted benzene.

Probable alkylated aromatic hydrocarbons.

TABLE 8-217.
IR REPORT

SAMPLE: 12-LC3, biological treatment plant sludge, pH 7 extract: LC cut #3 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3048	s	aromatic or olefinic CH stretch
2952-2924	s	aliphatic C-H stretch
2856	s	aliphatic C-H stretch
1725	w	ketones, esters
1602	s	aromatic or olefinic C-C
1445, 1376	s,m	aliphatic CH bend
1259	m	aromatic ether or ester
1184, 1150	m	ether, ester
883, 842, 814, 741	s	substituted aromatic CH bend
1917, 1026, 951	w	unassigned

OTHER REMARKS:

Broad weak band at 3400 - 3200 cm^{-1} suggests alcohols or phenols.
Probable alkylated aromatic hydrocarbons.

TABLE 8-218.
IR REPORT

SAMPLE: 12-LC4, biological treatment plant sludge, pH 7 extract: LC cut #4 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3418	m	OH or NH stretch (broad)
3048	m	aromatic C-H
2959, 2856	s	aliphatic C-H
1718	m	ketone, ester
1595	m	aromatic or olefin C=C
1458, 1438	s	methylene (doublet)
1376	m	$-CH_3$
876, 828, 807	m	aromatic C-H
746	s	aromatic C-H
1328, 1266, 1239, 1177, 1033, 951	w	unassigned

OTHER REMARKS:

Bands at 2363 - 2340 cm^{-1} are due to presence of CO_2 in cell.

Spikes about 1600 - 1800 are due to presence of water vapor in cell.

Probable alkylated aromatic hydrocarbons.

TABLE 8-219.
IR REPORT

SAMPLE: 12-LC5, biological treatment plant sludge, pH 7 extract: LC cut #5 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3048	w	aromatic or olefinic CH
2959, 2924, 2856	s	aliphatic CH
1602	m	aromatic C$\overset{\cdots}{-}$C stretch
1451	m	aliphatic CH bend
1375	w	methyl CH bend
883, 821, 752	w,w,s	substituted aromatic
2219, 1280, 1184	w	unassigned

OTHER REMARKS:

This sample possessed less mass than that required by the Level 1 criteria for IR analysis. A spectrum of acceptable quality was obtained by using Fourier Transform IR techniques.

Sample contains only saturated, unsaturated and/or aromatic hydrocarbons. Possibly some ketones or esters present as evidenced by small absorption at 1712 cm^{-1}.

TABLE 8-220.
IR REPORT

SAMPLE: 12-LC6, biological treatment plant sludge, pH 7 extract: LC cut #6 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3281	broad (M)	alcoholic, phenolic or acid OH
3055		aromatic OR olefinic CH
2959, 2931, 2856	s	aliphatic CH
1712	s	ketone or ester
1657	s	carboxylic acid or ketone
1602	s	aromatic or olefinic $C\overset{\cdots}{-}C$
1451, 1376	w	aliphatic CH bend
1280	m	acid, ester of aromatic acid
1191	m	ether, alcohol or phenol
810, 752	m	substituted aromatic CH
1081, 1033, 835, 615	w	unassigned

OTHER REMARKS:

Sample predominantly phenolic compounds, or carboxylic acids.

TABLE 8-221.
IR REPORT

SAMPLE: 12-LC7, biological treatment plant sludge, pH 7 extract: LC cut #7 IR

Wave Number (cm^{-1})	Intensity	Assignment/Comments
3550-3000	broad	phenol or alcoholic OH stretch
3061	s	aromatic or olefinic
2931, 2856	s	aliphatic CH stretch
1602	s	aromatic or olefinic $\mathrm{C}\overset{\cdots}{-}\mathrm{C}$
1280, 1122,		
1040	m	alcohol or phenol
828, 760	w	substituted aromatic CH bend
1664, 1726	w	unassigned

OTHER REMARKS:

Sample predominantly alcohol or phenolic compounds.

TABLE 8-222.
LRMS REPORT

SAMPLE: 9A-LC2, final cooler cooling tower hot well, pH 2 extract: LC cut #2 LRMS

Major Categories

Intensity	Category	MW Range
100	PNA's	

Sub-Categories, Specific Compounds

Intensity	Category	m/e	Composition
100	naphthalene	128	
100	phenanthrene, anthracene	178	
100	pyrene	202	
100	chrysene, triphenylene	252	
100	perylene, benzpyrene	252	
100	anthanthrene	276	

Other

Intensity	Comments
100	m/e 152
10	m/e 368. No significant features at m/e greater than 368.
100	acenaphthylidene?, m/e 152 PNA assignments supported by IR.

TABLE 8-223.
LRMS REPORT

SAMPLE: 9A-LC6, final cooler cooling tower hot well, pH 2 extract: LC cut #6 LRMS

Major Categories

Intensity	Category	MW Range
	none	

Sub-Categories, Specific Compounds

Intensity	Category	m/e	Composition
	none		

Other

Intensity	Comments
	No significant ion intensity > ∿420 amu
10	Prominent ions (70 eV) at m/e 414, 410, 386, 368, 349, 337, 280, 263
100	m/e 195, 149, 123, 109, 149 possible phthalate.

TABLE 8-224.
LRMS REPORT

SAMPLE: 8A-LC1, ammonia liquor, pH 2 extract: LC cut #1 LRMS

Major Categories

Intensity	Category	MW Range
10	PNA's	
100	Aliphatic	

Sub-Categories, Specific Compounds

Intensity	Category	m/e	Composition
10	perylene, benzpyrene	252	
10	chrysene, triphenylene	228	
10	anthracene, phenanthracene	178	

Other

Intensity	Comments
100	Clusters to high intensity peaks every 14 amu. From ∿125 amu to
	∿55 amu. Suggestive of saturated chains.

TABLE 8-225.
LRMS REPORT

SAMPLE: 8A-LC2, ammonia liquor, pH 2 extract: LC cut #2 LRMS

Major Categories

Intensity	Category	MW Range
100	PNA's	
10	PNA's	

Sub-Categories, Specific Compounds

Intensity	Category	m/e	Composition
100	Pyrene	202	
10	Perylene, benzpyrene	252	
10	Chrysene, triphenylene	228	
10	Anthracene, phenanthrene	178	
10	Acenaphthylene ?	152	
1	Anthracene ?	276	

Other

Intensity	Comments

TABLE 8-226.
LRMS REPORT

SAMPLE: 8A-LC3, ammonia liquor, pH 2 extract: LC cut #3 LRMS

Major Categories

Intensity	Category	MW Range
100	PNA's	

Sub-Categories, Specific Compounds

Intensity	Category	m/e	Composition
100	perylene, benzpyrene	252	
100	Chrysene, triphenylene	228	
100	Pyrene	202	
10	Anthracene, phenanthrene	178	

Other

Intensity	Comments
100	High molecular weight PNA's @ m/e 404, 378, 352, 326, 302, 276,
	compatible with IR.

TABLE 8-227.

LRMS REPORT

SAMPLE: 8A-LC4, ammonia liquor, pH 2 extract: LC cut #4 LRMS

Major Categories

Intensity	Category	MW Range
100-10	Amines	

Sub-Categories, Specific Compounds

Intensity	Category	m/e	Composition
10-100	Polyaromatic amines	341	
		317	
		291	
		267	
		241	
		217	

Other

Intensity	Comments

TABLE 8-228.

LRMS REPORT

SAMPLE: 8A-LC7, ammonia liquor, pH 2 extract: LC cut #5 LRMS

Major Categories

Intensity	Category	MW Range
10	PNA's	

Sub-Categories, Specific Compounds

Intensity	Category	m/e	Composition
10	perylene, benzpyrene	252	
	triphenylene, chrysene,	228	
	pyrene	202	
	anthracene, phenanthrene	178	

Other

Intensity	Comments
100	m/e 256?
	No significant ion intensity >∿256.

TABLE 8-229.
LRMS REPORT

SAMPLE: 8A-LC6, ammonia liquor, pH 2 extract: LC cut #6 LRMS

Major Categories

Intensity	Category	MW Range
10-100	Amines	

Sub-Categories, Specific Compounds

Intensity	Category	m/e	Composition
10-100	Amines. These materials show ion charac-	303	
	teristic of condensed aromatic rings.	279	
		253	
		229	
		203	
		195	
		179	
		159	
		145	

Other

Intensity	Comments
10-100	m/e 184, 122

TABLE 8-230.

LRMS REPORT

SAMPLE: 8B-LC3, ammonia liquor, pH 12 extract: LC cut #3 LRMS

Major Categories

Intensity	Category	MW Range
100	PNA's	

Sub-Categories, Specific Compounds

Intensity	Category	m/e	Composition
100	naphthalene	128	
10	anthracene, phenanthrene	178	
10	pyrene	202	
10	chrysene, triphenylene	228	
100	perylene, benzpyrene	252	
100	anthanthrene	276	

Other

Intensity	Comments
100 @ high probe temperatures	Ions at m/e 476, 474, 450, 426, 424, 400, 376, 374, 352, 350, 326, 302. Overall ms pattern strongly indicative of high molecular weight PNA's. PNA assignments supported by IR.

TABLE 8-231.
LRMS REPORT

SAMPLE: 8B-LC4, ammonia liquor, pH 12 extract: LC cut #4 LRMS

Major Categories

Intensity	Category	MW Range

Sub-Categories, Specific Compounds

Intensity	Category	m/e	Composition

Other Intensity Comments

	No significant ion intensity >~420 amu (70 eV). Many prominent ions
	throughout spectra of odd m/e (70 eV and 20 eV). Consistent with
	amine structures as indicated by IR. No PNA's present.

TABLE 8-232.
LRMS REPORT

SAMPLE: 8B-LC6, ammonia liquor, pH 12 extract: LC cut #6 LRMS

Major Categories

Intensity	Category	MW Range
100	Amines? m/e 401 (possibly halogenated),	
	377 {ionizing voltage = 20 eV}	

Sub-Categories, Specific Compounds

Intensity	Category	m/e	Composition

Other

Intensity	Comments
	m/e 327, 303, 277, 168, 149, 129 {ionizing voltage = 70 eV} Data not
	sufficient for subcategory or compound assignment.

TABLE 8-232.

LRMS REPORT

SAMPLE: 8B-LC7, ammonia liquor, pH 12 extract: LC cut #7 LRMS

Major Categories

Intensity	Category	MW Range
1-10	PNA's	

Sub-Categories, Specific Compounds

Intensity	Category	m/e	Composition
10	perylene, benzpyrene	252	
10	chrysene, triphenylene	228	
10	pyrene	202	

Other

	No significant ion intensity >∿m/e 300 with exception of one ion at
	m/e 368.
100	m/e 168, 144, 130, 118 (?)
10	m/e 182

ADDITIONAL DATA

TABLE 14. POLLUTANTS FROM BY-PRODUCT RECOVERY PLANT

Stream Number	Stream Identification	Rate: Constituents Based on 1 Mg Coke Production
1	Coal	1.4 Mg
2	Coke	1 Mg
3	Tar Decanter-Fugitive	2.15 sm^3/Mg: benzene, 15.6 g/Mg; H_2S 12.7 g/Mg; XAD-2 sample primarily LC cut #2*
4	Tar Sludge	0.1 l/Mg (very rough estimate): contains tar, coal, and coke fines; no Level 1 analysis
5	Tar Dewatering-Fugitive	Included in 6 below
6	Tar Storage-Fugitive	0.14 sm^3/Mg (working loss only): low rate benzene, toluene; XAD-2 sample primarily LC cut #2*
7	Primary Cooler Condensate Fugitive	1.7 sm^3/Mg: benzene, 9 g/Mg coke; H_2S 5.7 g/Mg; XAD-2 sample not collected
8	Tar Refining-Vapor	Not sampled.
9	Chemical Oil Storage-Fugitive	.024 sm^3/Mg (working loss only): low rate benzene, toluene; XAD-2 sample mostly LC cut #2* and #3
10	Excess Liquor Tanks-Fugitive	Not sampled: at lower temperature than 7 above, but roughly same composition
11	Sulfate Drying	Not sampled
12	Acid Storage-Fugitive	No measurable vent: not sampled
13	Lime Leg Sludge	0.35 kg/Mg: primarily calcium salts
14	Barometric Condenser Water	143 l/Mg: cyanide, 2 g/Mg; ammonia, 1.6 g/Mg; phenol, 0.5 g/Mg (Dunlap and McMichael)
15	Excess Ammonia Liquor	143 l/Mg: cyanide, 8.6 g/Mg; ammonia, 857 g/Mg; phenol, 208 g/Mg (Dunlap and McMichael)
16	Naphthalene Separation	No measurable vent rate: vapor high in benzene and homologs, H_2S; XAD-2 sample mostly LC cuts #2* and #3
17	Naphthalene Drying	2.9 sm^3/Mg: Naphthalene emissions as high as 533 g/sm^3, but an average must be considerably lower.
18	Final Cooler Cooling Tower	3,230 sm^3/Mg: benzene, 51.6 g/Mg; H_2S, 11 g/Mg; XAD-2 sample mostly LC cuts #2* and #3
19	Cooling Tower Blowdown	43-430 l/Mg: cyanide, 22-43 g/Mg; ammonia, 8-17 g/Mg; phenol, 10-16 g/Mg (Dunlap and McMichael)
20	Light Oil Plant Wastewater	100-500 l/Mg: cyanide, 0.5-1 g/Mg; ammonia, 0.5-1.5 g/Mg; phenol, 0.8-26 g/Mg (Dunlap and and McMichael), 3 kg/Mg oil (Schroeder)
21	Wash Oil Tanks-Fugitive	No measurable vent: not sampled
22	Light Oil Decanter-Fugitive	Inaccessible: not measured or observed
23	Light Oil Storage-Fugitive	0.013 sm^3/Mg working loss, 15.6 sm^3/Mg breathing loss (crude estimate[95]): benzene, 17.4 g/Mg; toluene, 0.6 g/Mg; H_2S, 0.5 g/Mg
24	Wash Oil Sludge	Not sampled and rate not available.
25	Desulfurization Wastewater	40-60 l/Mg vacuum carbonate plant: cyanide, 64 g/Mg (Dunlap and McMichael)
26	Desulfurization Sludge	Not quantified
27	Wastewater Plant Fugitive	No measurable rate
28	Wastewater Plant Sludge	1.7 kg/Mg: high phenolic levels
29	Final Effluent	470-1,260 l/Mg coke: BPCTCA gives 730 l/Mg; cyanide, 20 g/Mg; ammonia, 91 g/Mg; phenol, 1.5 g/Mg; oil, 11 g/Mg

*LC Cut #2 expected to contain aromatic hydrocarbons, fused polycyclics, fused nonalternant polycyclics, and possibly halogenated aromatics.

TABLE 15. SUMMARY OF ORGANIC ANALYSIS, TAR DECANTER VAPOR
Emission rate: 2.15 sm^3/Mg coke

Compounds Identified by GC	Concentration, mg/sm^3	MEGs[a] Category Number	MATE[b] Values, mg/sm^3	Ratio $\left(\frac{\text{Conc. Found}}{\text{MATE}}\right)$
C_1-C_7 HC(Avg. MW≅22)	4,550	1	min. = 32	142
Benzene	7,283	15	3	2,430
Toluene	746	15	375	2.0
Xylenes and ethylbenzene	186	15	435	0.43
Sulfur compounds (as H_2S)	5,914	53	15	394

Liquid Chromatography	MATE Comparison Value, mg/sm^3	MEGs[a] Category Number	Min. MATE[b] Value in Category	Ratio
Aliphatic hydrocarbons	141.8	1[c]	32	4.4[c]
Halogenated aliphatics	3.2	2[c]	0.1	32[c]
Aromatic hydrocarbons	*519*	*15,21A,22*	*1.0*	*519*
Halogenated aromatics	43.0	16[c]	0.7	61.4[c]
Heterocyclic N, O, S compounds	*0.95*	*23,24,25*	*0.1[9]*[d]	*9.5*[c]*[0.1]*[d]
Sulfides, disulfides	0.95	13b	20	0.04[c]
Nitriles	0.95	9[c]	1.1	0.86[c]
Ethers	185	3[c],4[c]	0.01	18,500[c]
Aldehydes, ketones	82.8	7[c]	0.2	414[c]
Nitroaromatics	3.33	17[c]	1.0	3.33[c]
Alcohols	6.4	5[c],6[c]	10	0.64[c]
Amines	8.16	10[c],11[c],12[c]	0.001	8,160[c]
Phenols	*5.9*	*18,19*[c]*,20*[c]	*0.1[10]*[d]	*59*[c]*[0.59]*[d]
Esters, amides	157	8C,8D[c]	1.0	157[c]
Mercaptans	2.95	13A[c]	1.0	2.95[c]
Carboxylic acids	24.2	8A,8B[c]	0.3	81[c]
Sulfoxides	2.96	14[c]	1.0	2.96[c]

GRAV conc. in sampled gas 2,720-3,550 mg/sm^3

TCO conc. in sampled gas 5,110 mg/sm^3

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[a] MEG = Multimedia Environmental Goals

[b] MATE = Minimum Acute Toxicity Effluent

[c] Not indicated by GC/MS work

[d] Reflects compounds found by GC/MS work

Italics highlight categories found by GC/MS.

TABLE 15. (continued)

IDENTIFICATION

Elution Temperature (°C)	Compound	Elution Temperature (°C)	Compound
70	Benzene	161.7	C_2-naphthalene
70	Toulene (?)	162.3	Biphenylene
98.3	Phenol	167.1	Acenaphthene
101.2	Indene	167.7	Methyl-biphenyl
107.9,113.1	Cresols	172.3	Dibenzofuran
118.5	Divinyl benzene (?)[a]	178.3	Methyl-acenaphthene
123.0	Naphthalene	180.3	Fluorene
124.6	Benxothiophene	183.5	Carbazole (?)
131.0	Quinoline or isoquinoline	185.7	Hydroxyfluorene isomer
134.8	Methylindene	186.3	Methylacenaphthene isomer (?)
140.6	Methylnaphthalene	187.9	Hydroxyfluorene isomer
143.5	Methylnaphthalene	201.4	Dibenzothiophene
174.4	Indole	204.6	Phenanthrene
149.2	Methyl-quinoline	205.5	d_{10}-anthracene[b]
153.1	Biphenyl	206.2	Anthracene (?)
156.3	C_2 -naphthalene	220.3	4,5-Methylenephenanthrene
156.9	C_2 -naphthalene	236.3	Fluoranthene
158.8	C_2 -naphthalene	241.7	Pyrene

QUANTITATION

Of those compounds identified, only quinoline and biphenyl were quantitated. Subjectively, naphthalene appeared to be the prevalent compound.

Compound	Wt. of Compound In XAD Extract (mg)	Wt. of Compound in Canister Rinse (mg)	Total Wt.	Concentration (mg/sm^3) in Gas Sample
Biphenyl	144.3	14.9	159.2	19.6
Quinoline	294.2	29.1	323.3	39.7

[a] Often an artifact from sample contact with plastics.

[b] Internal standard.

TABLE 16. SUMMARY OF ORGANIC ANALYSIS, PRIMARY COOLER CONDENSATE TANK VENT

Emission Rate: 1.7 sm^3/Mg coke

Compounds Identified by GC	Concentration mg/sm^3	MEG's Category[a] Number	MATE Value[b] (mg/sm^3)	Ratio $\left(\frac{\text{Found}}{\text{MATE}}\right)$
C_1-C_7 HC (Average MW≅23.6)	1,883	1	min. = 32	59
Benzene	5,230	15	3	1,740
Toluene	649	15	375	1.7
Xylenes and ethylbenzene	215	15	435	0.5
Sulfur compounds (as H_2S)	3,324	53	15	222

[a] MEG = Multi-Media Environmental Goals.

[b] MATE = Minimum Acute Toxicity Effluent.

TABLE 17. SUMMARY OF ORGANIC ANALYSIS, VAPOR ABOVE TAR STORAGE TANK

Emission rate: 0.14 sm^3/Mg coke

Compounds Identified by GC	Concentration, mg/sm^3	MEGs[a] Category Number	MATE[b] Values, mg/sm^3	Ratio $\left(\frac{\text{Conc. Found}}{\text{MATE}}\right)$
C_1-C_7 HC(Avg. MW≅19)	3.75	1	min. = 32	0.12
Benzene	65.6	15	3	22
Toluene	21.1	15	375	0.06
Xylenes and ethylbenzene	16.3	15	435	0.04
Sulfur compounds (as H_2S)	not detected	53	15	-

Liquid Chromatography	MATE Comparison Value, mg/sm^3	MEGs[a] Category Number	Min. MATE[b] Value in Category	Ratio
Aliphatic hydrocarbons	1.6	1[c]	32	0.05[c]
Halogenated aliphatics	0.16	2[c]	0.1	1.6[c]
Aromatic hydrocarbons	*32.1*	*15,21A,22*	*1.0*	*32.1*
Halogenated aromatics	1.45	16[c]	0.7	2.1[c]
Heterocyclic N, O, S compounds	*1.11*	*23,24,25*	*0.1*	*11.1*
Sulfides, disulfides	1.11	13B[c]	20	0.06[c]
Nitriles	*1.11*	*9*	*1.1[30]*[d]	*1.0*[c]*[0.04]*[d]
Ethers	19.5	3,4[c]	0.01	1,950[c]
Aldehydes, ketones	28.5	7[c]	0.2	143[c]
Nitroaromatics	0.71	17[c]	1.0	0.71[c]
Alcohols	8.1	5,6[c]	10	0.81[c]
Amines	1.79	10[c],11[c],12[c]	0.001	1,770[c]
Phenols	*6.7*	*18,19*[c]*,20*[c]	*0.1[10]*[d]	*67*[c]*[0.7]*[d]
Esters, amides	30.1	8C,8D[c]	1.0	30.1[c]
Mercaptans	1.1	13A[c]	1.0	1.1[c]
Carboxylic acids	1.1	8A[c],8B[c]	0.3	3.7[c]
Sulfoxides	1.1	14[c]	1.0	1.1[c]
GRAV conc. in sample	37.0-582 mg/sm^3			
TCO conc. in sample	1,450 mg/sm^3			

[a] MEG = Multimedia Environmental Goals

[b] MATE = Minimum Acute Toxicity Effluent

[c] Not indicated by GC/MS work

[d] Reflects compounds found by GC/MS work

Italics highlight categories found by GC/MS

TABLE 17. (continued)

IDENTIFICATION

Elution Temperature (°C)	Compound	Elution Temperature (°C)	Compound
70.0	Benzene	122.0	C_2-phenol (?)
70.0	Toluene	122.7	Naphthalene
70.0	Pyridine	124.9	Benzothiophene
77.2	m- and p-Xylenes	131.6	Quinoline
79.5	Styrene[a]	141.2	Methylnaphthalene
80.1	p-Xylene	143.5	Methylnaphthalene
90.7	Benzofuran	153.4	Biphenyl
92.6	Methylpyridines	157.5	C_2-naphthalene
93.9	Benzofuran	159.8	C_2-naphthalene
94.5	C_3-benzenes	163.3	Biphenylene or acenaphthylene (?)
98.7	Phenol	168.1	Acenaphthene
101.5	Indene	173.2	Dibenzofuran
104.4	C_4-benzenes	181.9	Fluorene
107.3	Cresol	190.5	X-methylacenaphthylene
108.9	$C_{10}H_{12}$ isomer	190.5	Aminoethylcarbazole
112.7	Cresol	205.9	Phenanthrene
113.1	Methylindene	207.5	d_{10}-anthracene[b]

QUANTITATION

Of those compounds identified, only quinoline and biphenyl were quantitated. Subjectively, naphthalene appeared to be the prevalent compound.

Compound	Wt. of Compound In XAD Extract (mg)	Wt. of Compound In Canister Rinse (mg)	Total Wt.	Concentration (mg/sm³) in Gas Sample
Biphenyl	10.4	0.5	10.9	1.9
Quinoline	31.1	1.4	32.5	5.8

[a] Often an artifact from sample contact with plastics.

[b] Internal standard.

TABLE 18. SUMMARY OF ORGANIC ANALYSIS, VAPOR ABOVE CHEMICAL OIL TANK
Emission rate: 0.024sm^3/Mg coke

Compounds Identified by GC	Concentration, mg/sm^3	MEGs[a] Category number	MATE[b] Values, mg/sm^3	Ratio $\left(\frac{\text{Conc. Found}}{\text{MATE}}\right)$
C_1-C_7 HC(Avg. MW≅16)	1.86	1	min. = 32	0.06
Benzene	327	15	3	109
Toluene	266	15	375	0.709
Xylenes and ethylbenzene	200	15	435	0.46
Sulfur compounds (as H_2S)	not detected	53	15	-

Liquid Chromatography	MATE Comparison Value mg/sm^3	MEGs[a] Category Number	Min. MATE[b] Value in Category	Ratio
Aliphatic hydrocarbons	*(34.8)*	*1*	*32*	*1.1*
Halogenated aliphatics	*(3.48)*	*2*	*0.1*	*5*
Aromatic hydrocarbons	*(640)*	*15,21A,22*	*1.0*	*640*
Halogenated aromatics	(57.7)	16	0.7	82
Heterocyclic N, O, S compounds	*(8.64)*	*23,24,25*	*0.1*	*86*
Sulfides, disulfides	(8.64)	13B	20	0.43
Nitriles	*(8.64)*	*9*	*1.1*	*7.8*
Ethers	(186)	3,4	0.01	18,600
Aldehydes, ketones	(165)	7	0.2	825
Nitroaromatics	(4.2)	17	1.0	4.2
Alcohols	(6.3)	5,6	10	0.63
Amines	*(6.3)*	*10,11,12*	*0.001*	*6,300*
Phenols	*(4.9)*	*18,19,20*	*0.1*	*49*
Esters, amides	(165)	8C,8D	1.0	165
Mercaptans	(4.9)	13A	1.0	4.9
Carboxylic acids	*(4.9)*	*8A,8B*	*0.3*	*16.3*
Sulfoxides	(4.9)	14	1.0	4.9
GRAV conc. in sample	860-1,950 mg/sm^3			
TCO conc. in sample	2,050 mg/sm^3			

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[a] MEG = Multimedia Environmental Goals

[b] MATE = Minimum Acute Toxicity Effluent

Values in parentheses are partially based on GRAV mass before subtraction of blank.

Italics highlight categories found by GC/MS in other samples.

TABLE 19. SUMMARY OF ORGANIC ANALYSIS, FROTH FLOTATION SEPARATOR

Emission rate: unknown

Compounds Identified by GC	Concentration, mg/sm^3	MEGs[a] Category Number	MATE[b] Values, mg/sm^3	Ratio $\left(\frac{\text{Conc. Found}}{\text{MATE}}\right)$
C_1-C_7 HC(Avg. MW≅24)	2,051	1	min. = 32	64
Benzene	4,700	15	3	1,570
Toluene	488	15	375	1.3
Xylenes and ethylbenzene	82.1	15	435	0.2
Sulfur compounds (as H_2S)	2,125	53	15	140

Liquid Chromatography	MATE Comparison Value, mg/sm^3	MEGs[a] Category Number	Min. MATE[b] Value in Category	Ratio
Aliphatic hydrocarbons	*(11.7)*	*1*	*32*	*0.36*
Halogenated aliphatics	*(1.18)*	*2*	*0.1*	*11.8*
Aromatic hydrocarbons	*(33.8)*	*15,21A,22*	*1.0*	*33.8*
Halogenated aromatics	(1.69)	16	0.7	2.41
Heterocyclic N, O, S compounds	*(1.07)*	*23,24,25*	*0.1*	*10.7*
Sulfides, disulfides	(1.07)	13B	20	0.05
Nitriles	*(1.07)*	*9*	*1.1*	*1.0*
Ethers	(22.2)	3,4	0.01	2,220
Aldehydes, ketones	(39.9)	7	0.2	200
Nitroaromatics	(0.96)	17	1.0	1.0
Alcohols	(12.8)	5,6	10	1.28
Amines	*(3.4)*	*10,11,12*	*0.001*	*3,400*
Phenols	*(5.8)*	*18,19,20*	*0.1*	*58*
Esters, amides	(43.5)	8C,8D	1.0	43.5
Mercaptans	(1.2)	13A	1.0	1.2
Carboxylic acids	*(1.2)*	*8A,8B*	*0.3*	*4*
Sulfoxides	(1.2)	14	1.0	1.2
GRAV conc. in sample	18.9-19.9 mg/sm^3			
TCO conc. in sample	660 mg/sm^3			

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[a] MEG = Multimedia Environmental Goals

[b] MATE = Minimum Acute Toxicity Effluent

Values in parentheses are based on GRAV mass before subtraction of blank.

Italics highlight categories found by GC/MS in other samples.

TABLE 20. SUMMARY OF ORGANIC ANALYSIS, FINAL COOLER COOLING TOWER VAPOR
Emission rate: 3,230 sm^3/Mg coke

Compounds Identified by GC	Concentration, mg/sm^3	MEG's Category Number	MATE[b] Values, mg/sm^3	Ratio $\left(\frac{\text{Conc. Found}}{\text{MATE}}\right)$
C_1-C_7 HC (Avg. MW≅16)	1.89	1	min. = 32	0.06
Benzene	15.8	15	3	5.3
Toluene	not detected	15	375	-
Xylenes and ethylbenzene	not detected	15	435	-
Sulfur compounds (as H_2S)	3.3	53	15	0.2

Liquid Chromatography	MATE Comparison Value, mg/sm^3	MEG's[a] Category Number	Min. MATE[b] Value in Category	Ratio
Aliphatic hydrocarbons	*(1.90)*	*1*	*32*	*0.06*
Halogenated aliphatics	*(0.08)*	*2*	*0.1*	*0.8*
Aromatic hydrocarbons	*(4.76)*	*15,21A,22*	*1.0*	*4.76*
Halogenated aromatics	(0.21)	16[c]	0.7	0.3[c]
Heterocyclic N, O, S Compounds	*(0.08)*	*23,24,25*	*0.1*	*0.8*
Sulfides, disulfides	(0.09)	13B[c]	20	0.004[c]
Nitriles	*(0.08)*	*9*	*1.1*	*0.07*
Ethers	(2.38)	3[c],4[c]	0.01	238
Aldehydes, ketones	(3.68)	7[c]	0.2	18.4[c]
Nitroaromatics	*(0.17)*	*17*	*1.0*	*0.17*
Alcohols	(1.42)	5[c],6[c]	10	0.14[c]
Amines	*(0.25)*	*10,11[c],12[c]*	*0.001[19][d]*	*250[0.01][d]*
Phenols	*(0.21)*	*18,19[c],20[c]*	*0.1[10][d]*	*2.1[c][0.02][d]*
Esters, amides	(3.68)	8C[c],8D[c]	1.0	3.68[c]
Mercaptans	(0.21)	13A[c]	1.0	0.21[c]
Carboxylic acids	*(0.21)*	*8A,8B*	*0.3*	*0.7*
Sulfoxides	(0.21)	14[c]	1.0	0.21[c]
GRAV conc. in sample	2.75-10.6 mg/sm^3			
TCO conc. in sample	226 mg/sm^3			

[a] MEG = Multimedia Environmental Goals

[b] MATE = Minimum Acute Toxicity Effluent

Values in parentheses are based on GRAV mass before substraction of blank.

[c] Not indicated by GC/MS work

[d] Reflects compounds found by GC/MS work

Italics highlight categories found by GC/MS.

TABLE 20. (continued)

IDENTIFICATION

Elution Temperature (°C)	Compound	Elution Temperature (°C)	Compound
100.0	1,1,1-Trichloroethane	125.1	Methyl indenes
100.0	Benzene	128.3	C_2-phenols
100.0	Cyclohexene	129.3	Naphthalene
100.0	Pyridine	137.0	Quinoline
100.0	Toluene	144.0	Methylbenzothiophene isomer
100.0	X-methylpyridines	145.3	Methylnaphthalene
100.0	Xylenes	147.5	Methylnaphthalene
100.0	Phenylacetylene (?)	151.7	Indole
100.0	C_2-pyridines	156.8	Biphenyl
100.0	Styrene[a]	161.3,163.2	C_2-naphthalene isomers
102.1	C_2-pyridine		
105.6	Benzonitrile	166.7	Biphenylene
106.9	Aniline	171.5,171.9 172.9	$C_{13}H_{12}$ and $C_{14}H_{14}$ isomers, acenaphthene
107.9	Benzofuran	176.3	Dibenzofuran
108.8	C_2-pyridine (?)	186.3	Fluorene
109.8	Phenol	193.9,198.1	Amino ethylcarbazole (?)
112.7	Indene	210.3	Phenanthrene
115.5	C_7H_9N isomer	210.6	D_{10}-anthracene
116.2	Cresols	265.0	a phthalate[a]
118.1	$C_{10}H_{12}$ isomer	265.0	a phthalate[a]

QUANTITATION

Of those compounds identified, only quinoline and biphenyl were quantitated. Subjectively, naphthalene appeared to be the prevalent compound.

Compound	Wt. of Compound In XAD Extract (mg)	Wt. of Compound in Canister Rinse (mg)	Total Wt.	Concentration (mg/sm^3) in Gas Sample
Biphenyl	1.7	0	1.7	0.06
Quinoline	10.2	0	10.2	0.37

[a] Often an artifact from sample contact with plastics.

[b] Internal standard.

TABLE 22. SUMMARY OF ORGANIC ANALYSIS, LIGHT OIL STORAGE

Emission Rate: 15.6 sm^3/Mg coke

Compounds Identified by GC	Concentration mg/sm^3	MEG's Category Number[a]	MATE Value[b] (mg/sm^3)	Ratio $\left(\frac{Found}{MATE}\right)$
C_1-C_7 HC (Average MW≅46)	225	1	min. = 32	7
Benzene	1,040	15	3	347
Toluene	36.8	15	375	0.1
Xylenes and ethylbenzene	not detected	15	435	---
Sulfur compounds (as H_2S)	37-44	53	15	2.5-2.9

[a] MEG = Multimedia Environmental Goals.

[b] MATE = Minimum Acute Toxicity Effluent.

TABLE 25. SUMMARY OF ORGANIC ANALYSES, BIOLOGICAL TREATMENT PLANT SLUDGE

Liquid Chromatography	MATE Comparison Value,[c] mg/kg	MEG's Category Number	Min. MATE Value in Category	Ratio
Aliphatic hydrocarbons	2.1	1	None published	None published
Halogenated aliphatics	0.2	2	20	0.01
Aromatic hydrocarbons	6.45	15,21A,22	0.003	2,150
Halogenated aromatics	0.13	16	0.00001	13,000
Heterocyclic N, O, S compounds	0.025	23,24,25	3.0	0.008
Sulfide, disulfides	0.025	13B	None published	-
Nitriles	0.025	9	2.0	0.012
Ethers	3.32	3,4	20	0.17
Aldehydes, ketones	3.5	7	0.2	17.5
Nitroaromatics	0.3	17	2.0	0.15
Alcohols	3.00	5,6	2.0	1.5
Amines	0.30	10,11,12	0.04	7.5
Phenols	3.2	18,19,20	0.01	320
Esters, amides	3.5	8C,8D	0.003	1,170
Mercaptans	0.33	13A	30	0.01
Carboxylic acids	2.73	8A,8B	2.0	1.4
Sulfoxides	0.03	14	1,200	0.00002
GRAV conc.	5.9 - 7.4 mg/kg			
TCO conc.	0.4 - 17.8 mg/kg			

[a] MEG = Multimedia Environmental Goals.

[b] MATE = Minimum Acute Toxicity Effluent.

[c] Sludge density assumed to be 1 g/ml.

TABLE 26. BIOLOGICAL TREATMENT PLANT TESTING—SELECTED RESULTS[1]

COMPONENT	UNITS	AVERAGE OF 3 SAMPLES	
		FEED	EFFLUENT
Ammonia	mg/l	26	0.73
Organic carbon	mg/l	383	53
Chloride (diss.)	mg/l	371	202
Cyanide Amenable to Chlorination	mg/l	0.48	0.33
Total cyanide	mg/l	2.74	2.34
Cyanide (AISI)	mg/l	0.18	0.07
Nitrogen (Kjeldahl)	mg/l	102	10.9
Suspended solids	mg/l	79	39
Solvent extract (oil) EPA method	mg/l	20	4.3
Sulfate (diss.)	mg/l	202	342
Sulfide	mg/l	153	<0.3
Thiocyanate (SCN)	mg/l	197	0.73
Cyanate (CNO)	mg/l	3.6	0.35
Phenolic compounds (phenol)	mg/l	231	0.028
pH		11.2	7.4
Organic compounds[2]		Range from 3 Samples	
acenaphthene	ppb	0	1-6
benzene	ppb	0 < 350	<1 to <371
carbon tetrachloride	ppb	0	0 to 9
chlorobenzene	ppb	0 to 250	159 to 264
hexachlorobenzene	ppb	0 to 17,100	46 to 82
1,1,2,2-tetrachloroethane	ppb	0 < 900	<3 to <820
2-chloronaphthalene	ppb	0 to 160	0
2,4,6-trichlorophenol	ppb	ND	ND
parachlorometa cresol	ppb	ND to 2,130	10 to 168
chloroform	ppb	0 to < 3,800	9 to <990
2-chlorophenol	ppb	ND	ND
1,1-dichloroethylene	ppb	0 to <4,600	0 to <1,205
2,4-dichlorophenol	ppb	ND to 4,500	ND
2,4-dinitrotoluene	ppb	0	<7 to 10
2,6-dinitrotoluene	ppb	0 to 29,700	0 to <7
1,2-diphenylhydrazine	ppb	0	0 to 137
ethylbenzene	ppb	0 to 100	
fluoranthene	ppb	0 to 190	0 to 12
2-nitrophenol	ppb	ND	ND
4-nitrophenol	ppb	ND	ND
2,4-dinitrophenol	ppb	ND	ND
4,6-dinitro-o-cresol	ppb	ND	ND
pentachlorophenol	ppb	ND	ND to 93
phenol	ppb	112,000 to 131,500	ND to 35
bis(2-ethylhexyl)phthalate	ppb	0 to 29,000	0 to 39
butyl benzyl phthalate	ppb	200 to 8,600	2 to 85
di-n-butyl phthalate	ppb	40 to 12,100	14 to 22
di-n-octyl phthalate	ppb	0 to 350	0 to 320
dimethyl phthalate	ppb	0	0 to 53
benzo(a)anthracene	ppb	0 to 2,270	0 to 24
benzo(a)pyrene	ppb	0 to 330	0 to 44
3,4-benzofluoranthene	ppb	0 to <140	0 to <6
benzo(k)fluoranthene	ppb	0 to <140	0 to <6
chrysene	ppb	0 to 3,800	0 to 14
acenaphthylene	ppb	90 to 34,900	0 to 6
anthracene	ppb	<200 to <1,000	0 to <239
benzo(gni)perylene	ppb	0	0 to <1
fluorene	ppb	0 to <1,000	5 to 9
phenanthrene	ppb	<200 to <1,000	0 to <239
dibenzo(a,h)anthracene	ppb	0	0 to <1
indene(1,2,3-cd)pyrene	ppb	0	0 to <1
pyrene	ppb	0 to 280	16 to 38
tetrachloroethylene	ppb	0 to <650	0 to <580
toluene	ppb	0 to 120	0 to 100
trichloroethylene	ppb	0 to <100	0 to <1,148

NOTES:

[1] These are preliminary data released by the Effluent Guidelines Division, U.S. EPA.[64]

[2] ND indicates not detected in one of the three samples. "0" indicates that no evidence was found, but that noise in the spectrum prevents a clear ND.

TABLE 28. SUMMARY OF ORGANIC ANALYSIS, UPWIND AMBIENT

Compounds Identified by GC	Concentration, mg/sm^3	MEGs[a] Category Number	MATE[b] Value, mg/sm^3	Ratio $\left(\frac{\text{Conc. Found}}{\text{MATE}}\right)$
C_1-C_7 HC (Avg. MW = 16)	1.9	1	min. = 32	0.06
Benzene	1.95	15	3	0.65
Toluene	not detected	15	375	--
Xylenes and ethylbenzene	not detected	15	435	--
Sulfur compounds (as H_2S)	not detected	53	15	--

Liquid Chromotography	MATE Comparison Value mg/sm^3	MEGs[a] Category Number	Min. MATE[b] Value in Category	Ratio
Aliphatic hydrocarbons	*0.12*	*1*	*32*	*0.004*
Halogenated aliphatics	--	2	0.1	--
Aromatic hydrocarbons	*0.32*	*15, 21A, 22*	*1.0*	*0.32*
Halogenated aromatics	0.02	16	0.7	0.03
Heterocyclic N, O, S compounds	--	*23, 24, 25*	*0.1*	--
Sulfides, disulfides	--	13B	20	--
Nitriles	--	*9*	*1.1*	--
Ethers	0.33	3, 4	0.01	33
Aldehydes, ketones	0.20	7	0.2	1.0
Nitroaromatics	*0.01*	*17*	*1.0*	*0.01*
Alcohols	0.03	5, 6	10	0.003
Amines	*0.03*	*10, 11, 12*	*0.001*	*30*
Phenols	*0.03*	*18, 19, 20*	*0.1*	*0.3*
Esters, amides	0.33	8C, 8D	1.0	0.33
Mercaptans	0.03	13A	1.0	0.03
Carboxylic acids	*0.03*	*8A, 8B*	*0.3*	*0.1*
Sulfoxides	0.03	14	1.0	0.03

GRAV conc. in sampled gas 0.8--1.4 mg/sm^3
TCO conc. in sampled gas 3.6 mg/sm^3

[a] MEG = Multimedia Environmental Goals.

[b] MATE = Minimum Acute Toxitity Effluent.

Italics highlight categories found by GC/MS in some samples.

TABLE 29. SUMMARY OF ORGANIC ANALYSIS, DOWNWIND AMBIENT

Emission Rate Compounds Identified by GC	Concentration, mg/sm^3	MEGs[a] Category Number	MATE[b] Value, mg/sm^3	Ratio $\left(\frac{\text{Conc. Found}}{\text{MATE}}\right)$
C_1-C_7 HC (Avg. MW ≅ 16)	2.2	1	min. = 32	0.07
Benzene	2.4	15	3	0.8
Toluene	not detected	15	375	--
Xylenes and ethylbenzene	not detected	15	435	--
Sulfur compounds (as H_2S)	not detected	53	15	--

Liquid Chromatography	MATE Comparison Value mg/sm^3	MEGs[a] Category Number	Min. MATE[b] Value in Category	Ratio
Aliphatic hydrocarbons		INSUFFICIENT ORGANIC MASS NO LIQUID CHROMATOGRAPHY		
Halogenated aliphatics				
Aromatic hydrocarbons				
Halogenated aromatics				
Heterocyclic N, O, S compounds				
Sulfides, disulfides				
Nitriles				
Ethers				
Aldehydes, ketones				
Nitroaromatics				
Alcohols				
Amines				
Phenols				
Esters, amides				
Mercaptans				
Carboxylic acids				
Sulfoxides				
GRAV conc. in sampled gas	1.2--2.2 mg/sm^3			
TCO conc. in sampled gas	0--0.1 mg/sm^3			

[a] MEG = Multimedia Environmental Goals.

[b] MATE = Minimum Acute Toxicity Effluent.

TABLE 30. ESTIMATED RELATIVE HAZARD OF COKE BY-PRODUCT PLANT SOURCES

Operation Emission Source	Source Emission Rate Per Mg Coal Fed	Ratios of Concentrations[a] to MATE Values (Defined as Hazard Units, HU)							Total Hazard Units Per scm, ℓ, or kg	Total Hazard Units Per Mg Coal	Normalized Relative Hazard[b]
		Light Aromatics (BTX)	Heavy Organics including PNA's	NH_3	Gaseous S Compounds	Cyanides	Phenols	Biphenyl & Quinoline			
Tar processing											
decanter vapor	1.5 scm	2,430	519	ND	394	ND	0.6	22.1	3,366	5,050	0.036
dewatering/ storage vapor	0.1 scm	22.1	43	ND	NTD	NTD	0.7	2.3	68	6.8	≈0
primary cooler condensate tank vapor	1.2 scm	1,745	ND	ND	222	NTD	ND	ND	1,967	2,400	0.017
distillation product storage vapor	0.02 scm	110	7,056	ND	ND	NTD	49	ND	7,215	140	0.001
Ammonia processing											
excess ammonia liquor	102 ℓ	Not an emission - treated in biotreatment plant									
Final cooler and napthalene handling											
cooling tower for contact cooler, gas	2,307 scm	5.3	7.4	ND	0.02	8.4	0.02	0.08	21.2	49,000	0.349
napthalene separator vapor	rate too low to measure	1,567	3,462	ND	142	ND	58	ND	5,229	-	-
napthalene dryer vapor	2.1 scm	Sample results unreasonable and not representative									
Light oil recovery											
wastewater (wash oil, sludge)	70-360 ℓ	Not an emission - treated in biotreatment plant									
light oil storage vapor	11.1 scm	346	ND	ND	2.6	ND	ND	ND	349	3,900	0.028
Wastewater											
biotreatment plant effluent	335-900 ℓ	0.2	77	NA	ND	NA	21.4	ND	98.6	61,000	0.434
biotreatment plant sludge	1.2 kg	ND	15,350	ND	ND	ND	320	ND	15,670	19,000	0.135
TOTAL										140,497	

ND: Not determined; NTD: Not detected; NA: Either concentration or MATE value not available

[a] For concentration ranges, the median was used

[b] Relative Hazard = Total hazard units per Mg coal/140,497

TABLE A-4. AROMATIC ANALYSIS
Froth Flotation Sample (ppm)

	Onsite		RTI
	Bulb 1	Bulb 2	SS can
Benzene	1814.8	1612.9	914.7
Toluene	162.9	136.1	82.9
Ethyl benzene	NA	NA	0.5
m & p Xylene	NA	NA	14.4
o Xylene	NA	NA	3.7

TABLE A-28. AROMATIC ANALYSIS
Onsite Analysis of Final Cooling Tower (ppm)

	Onsite		RTI
	Bulb 1	Bulb 2	SS can
Benzene	5.3	4.7	4.6
Toluene	---	---	---
Ethyl benzene	NA	NA	---
m & p Xylene	NA	NA	---
o Xylene	NA	NA	---

TABLE A-87. AROMATIC ANALYSIS
Tar Storage Tank (ppm)

	Onsite		RTI
	Bulb 1	Bulb 2	SS can
Benzene	20.6	20.0	20.0
Toluene	5.6	5.5	5.4
Ethyl benzene	NA	NA	---
m & p Xylene	NA	NA	2.5
o Xylene	NA	NA	1.2

TABLE A-109. AROMATIC ANALYSIS
Tar Decanter Tank (ppm)

	Onsite		RTI
	Bulb 1	Bulb 2	SS can
Benzene	2190.7	2139.1	2395.6
Toluene	191.5	177.9	214.7
Ethyl benzene	NA	NA	1.4
m & p Xylene	NA	NA	33.3
o Xylene	NA	NA	7.4

TABLE A-150. AROMATIC ANALYSIS
Light Oil Storage Tank (ppm)

	Onsite		RTI
	Bulb 1	Bulb 2	SS can
Benzene	306.1	296.3	358.3
Toluene	NA	8.5	10.6
Ethyl benzene	NA	NA	---
m & p Xylene	NA	NA	---
o Xylene	NA	NA	---

TABLE A-152. AROMATIC ANALYSIS
Chemical Storage Tank (ppm)

	Onsite		RTI
	Bulb 1	Bulb 2	SS can
Benzene	97.4	104.9	99.5
Toluene	68.5	69.5	70.5
Ethyl benzene	NA	NA	5.3
m & p Xylene	NA	NA	40.0
o Xylene	NA	NA	10.8

TABLE A-173. AROMATIC ANALYSIS
Coke Oven Gas (ppm)

	Onsite		RTI
	Bulb 1	Bulb 2	SS can
Benzene	6195.5	6421.0	1667.2
Toluene	437.0	248.0	67.8
Ethyl benzene	NA	NA	0.3
m & p Xylene	NA	NA	4.4
o Xylene	NA	NA	0.7

TABLE A-174. AROMATIC ANALYSIS
Primary Cooler Condensate Samples
(ppm)

	Onsite		RTI
	Bulb 1	Bulb 2	SS can
Benzene	1565.6		1653.4
Toluene	160.8		178.1
Ethyl benzene	NA		1.2
m & p Xylene	NA		37.7
o Xylene	NA		9.7

TABLE A-180. AROMATIC ANALYSIS
Upwind Ambient Trailer Location (ppm)

	Onsite		RTI
	Bulb 1	Bulb 2	SS can
Benzene	0.6		0.7
Toluene	---		---
Ethyl benzene	NA		---
m & p Xylene	NA		---
o Xylene	NA		

TABLE A-194. AROMATIC ANALYSIS
Downwind Ambient Chem Lab Site

	Onsite		RTI
	Bulb 1	Bulb 2	SS can
Benzene	1.3	0.3	---
Toluene	---	---	---
Ethyl benzene	NA	NA	---
m & p Xylene	NA	NA	---
o Xylene	NA	NA	---

TABLE A-3. FROTH FLOTATION SEPARATOR SAMPLE

Plant Name: United States Steel--Coke By-Product Plant

Location: Birmingham, Alabama

Date: 12/12/77

Test Performed By: F. J. Phoenix, E. E. Stevenson

Run Number: 1

Sampling Location: Wemco Separator

Pre Leak Test: 0.04

Post Leak Test: 0.04

Test Time:

Start: 10:15

Finish: 14:25

Meter Volume (c.f.):

Start: 630.59

Finish: 1680.24

Volume of Gas Sampled: 1049.65 c.f.

1011.29 scf

Average Gas Temperature (°F)

Ambient: 54°

Sampling Location: 54°

XAD-2 Resin: 54°

Meter Box: 85°

Comments:

1. No condensate collected.
2. Sampling performed in one of sixteen 8" x 50" openings in top of separator.

TABLE A-5. MATE COMPARISON VALUES, FROTH FLOTATION SEPARATOR, XAD-2 RESIN

	Preliminary	Concentrate	LC1	LC2	LC3	LC4	LC5	LC6	LC7	Σ
Total organics mg/sm³	649	474	0.0 (10.9)	419 (423)	7.0 (14)	0.87 (6.1)	42 (47)	0.0 (3.5)	0.0 (7.0)	469 (512)
TCO, mg	18,538	13,175	0.0	12,000	200	25	1,200	0.0	0.0	13,425
GRAV, mg	40	394.5	0.0 (312)	0.0 (100)	0.0 (200)	0.0 (150)	0.0 (150)	0.0 (100)	0.0 (200)	0.0 (1,212)

Category						MATE comparison value, mg/sm³*				
Aliphatic hydrocarbons			(10.9)							0.0 (10.9)
Halogenated aliphatics			(1.1)							0.0 (1.1)
Aromatic hydrocarbons				(3.49)	(7.00)	(5.24)	(5.24)	(3.49)	(7.00)	0.0 (31.5)
Halogenated aromatics				(0.35)	(0.70)	(0.52)				0.0 (1.57)
Heterocyclic N, O, S compounds						(0.52)	(0.52)			0.0 (1.04)
Sulfides, disulfides						(0.52)	(0.52)			0.0 (1.04)
Nitriles						(0.52)	(0.52)			0.0 (1.04)
Ethers				(3.49)	(7.00)	(0.52)	(0.52)	(3.49)	(7.00)	0.0 (22.0)
Aldehydes, ketones			(10.9)		(7.00)	(5.24)	(5.24)	(3.49)	(7.00)	0.0 (38.9)
Nitroaromatics							(0.52)	(0.35)		0.0 (0.87)
Alcohols							(5.24)	(0.35)	(7.00)	0.0 (12.6)
Amines							(0.52)	(0.35)	(0.70)	0.0 (2.09)
Phenols, halo and nitrophenols							(5.24)	(0.35)		0.0 (5.59)
Esters, amides			(10.9)	(3.49)	(7.00)	(5.24)	(5.24)	(3.49)	(7.00)	0.0 (42.4)
Mercaptans								(0.35)	(0.70)	0.0 (1.05)
Carboxylic acids								(0.35)	(0.70)	0.0 (1.05)
Sulfoxides								(0.35)	(0.70)	0.0 (1.05)

NOTE: Values in parentheses are GRAV mass before subtraction of blank. The presence of GRAV mass in the original sample is shown by the Preliminary and Concentrate samples. The MATE Comparison Value is based on the GRAV mass in the LC cut divided by the gas sample volume. For compound classes indicated by IR, the MATE comparison value is 100 percent of the GRAV concentration. For compound classes expected[65] but not identified by IR, the MATE Comparison Value is 10 percent of the GRAV concentration.

NOTE: MATE values are those in effect in January 1979.

TABLE A-15. MATE COMPARISON VALUES, FROTH FLOTATION SEPARATOR, CANISTER RINSE

	Preliminary	Concentrate	LC1	LC2	LC3	LC4	LC5	LC6	LC7	Σ
Total organics mg/sm^3	29.8	6.1	0.82	0.53	0.53	0.17	0.13	0.86	0.18	3.22
TCO, mg	360		0.0	2.0	0.4	0.0	0.0	1.4	0.0	3.8
GRAV, mg	493	174	23.4	15.1	14.7	4.9	3.7	23.2	5.3	90.3

Category	MATE comparison value, mg/sm^3*							
	LC1	LC2	LC3	LC4	LC5	LC6	LC7	Σ
Aliphatic hydrocarbons	0.82							0.82
Halogenated aliphatics	0.08							0.08
Aromatic hydrocarbons		0.53	0.51	0.17	0.13	0.81	0.18	2.33
Halogenated aromatics	0.05	0.05	0.02					0.12
Heterocyclic N,O,S compounds				0.02	0.01			0.03
Sulfides, disulfides				0.02	0.01			0.03
Nitriles				0.02	0.01			0.03
Ethers				0.02	0.13			0.15
Aldehydes, ketones					0.01	0.81	0.18	1.00
Nitroaromatics					0.01	0.08		0.09
Alcohols					0.13	0.08	0.02	0.23
Amines				0.17	0.13	0.81	0.18	1.29
Phenols, halo and nitrophenols					0.13	0.08	0.02	0.23
Esters, amides					0.13	0.81	0.18	1.12
Mercaptans						0.08	0.02	0.10
Carboxylic acids						0.08	0.02	0.10
Sulfoxides						0.08	0.02	0.10

NOTES: The MATE Comparison Value is based on the GRAV mass in the LC cut divided by the gas sample volume. For compound classes indicated by IR, the MATE comparison value is 100 percent of the GRAV concentration. For compound classes expected [65] but not identified by IR, the MATE Comparison Value is 10 percent of the GRAV concentration.

NOTE: MATE values are those in effect in January 1979.

TABLE A-25. CYANIDE GAS TRAIN DATA

Run #	1	2
Sampling Location	Final Cooler Cooling Tower	Final Cooler Cooling Tower
Volume Metered (scf)	0.732	0.962
Catch (CN^-) (mgms)	1.92	2.16
Concentration ppm	82.4	70.5
μgms/scm	92,618	70,284

TABLE A-26. GAS TRAIN DATA SHEET

Run #1

Plant Name: U.S. Steel

Location: Birmingham, Alabama

Sampling Location: Final cooling tower

Operator: B. Hawks

Date: 13 December 1977

Test Time:

Start: 0915.00

Finish: 0945.00

Meter Volume:

Start: 066.560

Finish: 067.286

Volume Sampled: 0.732 scf

ΔH Setting: 2 scfh

Gas Temperature at Meter Box:

Start: 56

Finish: 56

Ambient Temperature:

Start: 52

Finish: 52

Barometric Pressure: 29.50

Comments:

Gas train bubbling through 0.5M NaOH - 60 ml total volume NaOH

TABLE A-27. GAS TRAIN DATA SHEET

Run #2

Plant Name: U.S. Steel

Location: Birmingham, Alabama

Sampling Location: Final cooling tower

Operator: B. Hawks

Date: 13 December 1977

Test Time:

Start: 1015.00

Finish: 1045.00

Meter Volume:

Start: 067.700

Finish: 068.646

Volume sampled: 0.962 scf

ΔH Setting: 2 scfh

Gas Temperature at Meter Box:

Start: 56°

Finish: 60°

Ambient Temperature:

Start: 52°

Finish: 52°

Barometric Pressure: 29.50

Comments:

Gas train bubbling through 60 ml, 0.5M NaOH

TABLE A-29. SASS TRAIN DATA SHEET

Plant Name: U.S. Steel

Location: Birmingham, Alabama

Date: 12/13/77

Test Performed By: F. H. Phoenix, E. E. Stevenson

Run Number: 2

Sampling Location: Final Cooler Cooling Tower

Pre Leak Test: 0.00

Post Leak Test: 0.02

Test Time:

Start: 9:00

Finish: 12:45

Meter Volume (c.f.):

Start: 682.58

Finish: 1683.15

Volume of Gas Sampled: 1000.57 c.f.

974.75 scf.

Average Gas Temperature (°F)

Ambient: 58°

Sampling Location: -

XAD-2 Resin: 57°

Meter Box: 79°

Comments:

1. No condensate collected
2. Used 30' Teflon line as probe, ran from top of tower to XAD-2 module
3. Sampling performed in 1 of 2 ~8' diameter outlets - velocity taken from fan data
4. Also ran two gas train runs and took hot well and cold well water samples

TABLE A-30. MATE COMPARISON VALUES, FINAL COOLER COOLING TOWER, XAD-2 RESIN

	Preliminary	Concentrate	LC1	LC2	LC3	LC4	LC5	LC6	LC7	Σ
Total organics mg/sm³	222	61	0.0 (0.82)	37.0 (38.0)	0.76 (1.41)	1.20 (1.63)	0.98 (1.41)	6.74 (8.04)	0.0 (0.87)	46.7 (52.2)
TCO, mg	6,066	1,410	0.0	1,020	21	33	27	186	0.0	1,287
GRAV, mg	60	282	0.0 (22.5)	0.0 (30.0)	0.0 (18.0)	0.0 (12.0)	0.0 (2.12)	0.0 (36.0)	0.0 (24.0)	0.0 (154)

Category	MATE comparison value, mg/sm³*									
Aliphatic hydrocarbons			(0.82)	(1.08)						0.0 (1.90)
Halogenated aliphatics			(0.08)							0.0 (0.08)
Aromatic hydrocarbons				(1.08)	(0.65)	(0.43)	(0.43)	(1.30)	(0.87)	0.0 (4.76)
Halogenated aromatics				(0.11)	(0.06)	(0.04)				0.0 (0.21)
Heterocyclic N, O, S compounds						(0.04)	(0.04)			0.0 (0.08)
Sulfides, disulfides						(0.04)	(0.04)			0.0 (0.08)
Nitriles						(0.04)	(0.04)			0.0 (0.08)
Ethers					(0.65)	(0.43)	(0.43)		(0.87)	0.0 (2.38)
Aldehydes, ketones					(0.65)	(0.43)	(0.43)	(1.30)	(0.87)	0.0 (3.68)
Nitroaromatics							(0.04)	(0.13)		0.0 (0.17)
Alcohols							(0.04)	(1.30)	(0.08)	0.0 1.42)
Amines							(0.04)	(0.13)	(0.08)	0.0 (1.42)
Phenols, halo and nitrophenols								(0.13)	(0.08)	0.0 (0.21)
Esters, amides					(0.65)	(0.43)	(0.43)	(1.30)	(0.87)	0.0 (3.68)
Mercaptans								(0.13)	(0.08)	0.0 (0.21)
Carboxylic acids								(0.13)	(0.08)	0.0 (0.21)
Sulfoxides								(0.13)	(0.08)	0.0 (0.21)

NOTES: The MATE Comparison Value is based on the GRAV mass in the LC cut divided by the gas sample volume. For compound classes indicated by IR, the MATE Comparison Value is 100 percent of the GRAV concentration. For compound classes expected[65] but not identified by IR, the MATE Comparison Value is 10 percent of the GRAV concentration.

Values in parentheses are GRAV mass before subtraction of blank. The presence of GRAV mass in the original sample is shown by the Preliminary and Concentrate samples.

NOTE: MATE values are those in effect in January 1979.

TABLE A-86. SASS TRAIN DATA SHEET

Plant Name: U.S. Steel

Location: Birmingham, Alabama

Date: 12/13/77

Test Performed By: F. J. Phoenix, E. E. Stevenson

Run Number 3

Sampling Location: Tar Storage Tank

Pre Leak Test: 0.02

Post Leak Test: 0.05

Test Time:

Start: 14:55

Finish: 15:44

Meter Volume (c.f.):

Start: 685.67

Finish: 889.97

Volume of Gas Sampled: 202.28 c.f. *

199.06 scf.

Average Gas Temperature (°F)

Ambient: 60°

Sampling Location: 85°

XAD-2 Resin: 80°

Meter Box: 70°

Comments:

1. Naphthalene condensed on XAD-2 Module. We had to take module apart and clean off Naphthalene during run.

* 2.02 c.f. was subtracted from sample volume due to leak check during run.

TABLE A-88. MATE COMPARISON VALUES, VAPOR ABOVE TAR STORAGE TANK, XAD-2 RESIN

	Preliminary	Concentrate	LC1	LC2	LC3	LC4	LC5	LC6	LC7	Σ
Total organics mg/sm^3	1,192	1,530	76.3	1,780	148	37.4	24.11	192	10.63	2,270
TCO, mg	6,620	6,090	430	10,040	836	191	96	1,080	0.0	12,700
GRAV, mg	100	2,540	0.0	20	0.0	20	40	0.0	60	140

Category	LC1	LC2	LC3	LC4	LC5	LC6	LC7	Σ
	MATE comparison value, mg/sm^3*							
Aliphatic hydrocarbons	0.0							0.0
Halogenated aliphatics	0.0							0.0
Aromatic hydrocarbons		3.55	0.0	3.55	7.09		10.6	24.8
Halogenated aromatics		0.36	0.0	0.36				0.72
Heterocyclic N, O, S compounds				0.36	0.71			1.07
Sulfides, disulfides				0.36	0.71			1.07
Nitriles				0.36	0.71			1.07
Ethers				3.55	7.09			10.6
Aldehydes, ketones				3.55	7.09		10.6	21.2
Nitroaromatics					0.71			0.71
Alcohols					0.71		1.06	1.77
Amines					0.71		1.06	1.77
Phenols, halo and nitrophenols							1.06	1.06
Esters, amides				3.55	7.09		10.6	21.2
Mercaptans							1.06	1.06
Carboxylic acids							1.06	1.06
Sulfoxides							1.06	1.06

NOTE: The MATE Comparison Value is based on the GRAV mass in the LC cut divided by the gas sample volume. For compound classes indicated by IR, the MATE comparison value is 100 percent of the GRAV concentration. For compound classes expected[65] but not identified by IR, the MATE Comparison Value is 10 percent of the GRAV concentration.

NOTE: MATE values are those in effect in January 1979.

TABLE A-98. MATE COMPARISON VALUES, VAPOR ABOVE TAR STORAGE TANK, CANISTER RINSE

	Preliminary	Concentrate	LC1	LC2	LC3	LC4	LC5	LC6	LC7	Σ
Total organics mg/sm^3	293	132	5.90	70.1	81.6	0.86	0	4.3	0.0	162
TCO, mg	1,545		24.2	364	453	2.42	0.0	24.2	0.0	868
GRAV, mg	109 (spill)	743	9.10	31.5	7.28	2.42	0.0	0.0	0.0	50.3

Category	MATE comparison value, mg/sm^3*									
	Preliminary	Concentrate	LC1	LC2	LC3	LC4	LC5	LC6	LC7	Σ
Aliphatic hydrocarbons			1.6							1.6
Halogenated aliphatics			0.16							0.16
Aromatic hydrocarbons				5.6	1.3	0.43				7.33
Halogenated aromatics				0.56	0.13	0.04				0.73
Heterocyclic N,O,S compounds						0.04				0.04
Sulfides, disulfides						0.04				0.04
Nitriles						0.04				0.04
Ethers			1.6	5.6	1.3	0.43				8.93
Aldehydes, ketones				5.6	1.3	0.43				7.33
Nitroaromatics										0.0
Alcohols				5.6						5.6
Amines										0.0
Phenols, halo and nitrophenols				5.6						5.6
Esters, amides			1.6	5.6	1.3	0.43				8.9
Mercaptans										0.0
Carboxylic acids										0.0
Sulfoxides										0.0

NOTE: The MATE Comparison Value is based on the GRAV mass in the LC cut divided by the gas sample volume. For compound classes indicated by IR, the MATE comparison value is 100 percent of the GRAV concentration. For compound classes expected[65] but not identified by IR, the MATE Comparison Value is 10 percent of the GRAV concentration.

NOTE: MATE values are those in effect in January 1979.

TABLE A-108. SASS TRAIN DATA SHEET

Plant Name: U.S. Steel

Location: Birmingham, Alabama

Date: 12/14/77

Test Performed By: F. J. Phoenix, E. E. Stevenson

Run Number: 4

Sampling Location: Tar Decanter Tank

Pre Leak Test: 0.00

Post Leak Test: 0.02

Test Time:

Start: 9:00

Finish: 10:40

Meter Volume (c.f.):

Start: 893.59

Finish: 1191.67

Volume of Gas Sampled: 298.08 c.f.

287.41 scf.

Average Gas Temperature (°F)

Ambient: 61°

Sampling Location: 170°

XAD-2 Resin: 100°

Meter Box: 80°

Comments:

1. Used ice bath at samplling location to cool gases before passing through XAD-2 Resin.
2. Ran for ≈ 3-4 minutes when reaction took place in first impinger - Ammonia reacted with hydrogen peroxide - We decided to continue test without first impinger.
3. Sampling performed in one of 4 vents. Tank was leaking vapor in front.

TABLE A-110. MATE COMPARISON VALUES, TAR DECANTER VAPOR, XAD-2 RESIN

	Preliminary	Concentrate	LC1	LC2	LC3	LC4	LC5	LC6	LC7	Σ
Total organics mg/sm³	6,340	6,820	23.1	1,470	1,370	74	9.2	129	0.0	3,080
TCO, mg	31,520	33,680	0.0	11,025	11,175	600	75	600	0.0	23,475
GRAV, mg	20,080	21,840	188	900	0.0	0.0	0.0	450	0.0	1,540

Category	LC1	LC2	LC3	LC4	LC5	LC6	LC7	Σ
	MATE comparison value, mg/sm³*							
Aliphatic hydrocarbons	23.1	11.0						133
Halogenated aliphatics	2.3							2.3
Aromatic hydrocarbons		11.0				55.2		165
Halogenated aromatics		11.0						11
Heterocyclic N,O,S compounds								0.0
Sulfides, disulfides								0.0
Nitriles		11.0				55.2		165
Ethers						55.2		55.2
Aldehydes, ketones								0.0
Nitroaromatics								0.0
Alcohols								0.0
Amines								0.0
Phenols, halo and nitrophenols	23.1	11.0				55.2		188
Esters, amides								0.0
Mercaptans								0.0
Carboxylic acids								0.0
Sulfoxides								0.0

NOTE: The MATE Comparison Value is based on the GRAV mass in the LC cut divided by the gas sample volume. For compound classes indicated by IR, the MATE comparison value is 100 percent of the GRAV concentration. For compound classes expected[65] but not identified by IR, the MATE Comparison Value is 10 percent of the GRAV concentration.

NOTE: MATE values are those in effect in January 1979.

TABLE A-120. MATE COMPARISON VALUES, TAR DECANTER VAPOR, CANISTER RINSE

	Preliminary	Concentrate	LC1	LC2	LC3	LC4	LC5	LC6	LC7	Σ
Total organics mg/sm^3	1,220	800	7.68	972	10.7	1.54	4.61	40.7	3.07	1,040
TCO, mg	8,190		0.0	5,520	62.3	0.0	0.0	31.9	0.0	5,900
GRAV, mg	1,760	6,500	62.5	2,390	25.0	12.5	37.5	12.5	25.0	2,565

Category	MATE comparison value, mg/sm^3*							
	LC1	LC2	LC3	LC4	LC5	LC6	LC7	Σ
Aliphatic hydrocarbons	7.68							7.68
Halogenated aliphatics	0.77							0.77
Aromatic hydrocarbons		294	3.07	1.54	4.61	1.54	3.07	308
Halogenated aromatics		29.4	0.31	0.15				29.9
Heterocyclic N,O,S compounds				0.15	0.46			0.61
Sulfides, disulfides				0.15	0.46			0.61
Nitriles	7.68			0.15	0.46			0.61
Ethers	7.68			1.54	4.6	1.54	3.07	18.4
Aldehydes, ketones	7.68		3.07	1.54	4.6	1.54	3.07	21.5
Nitroaromatics					0.46	0.15		0.61
Alcohols					0.46	0.15	0.31	0.92
Amines			3.07		0.46	0.15	0.31	3.99
Phenols, halo and nitrophenols						0.15	0.31	0.46
Esters, amides	7.68		3.07	1.54	4.6	1.54	3.07	21.5
Mercaptans						0.15	0.31	0.46
Carboxylic acids						0.15	0.31	0.46
Sulfoxides						0.15	0.31	0.46

NOTE: The MATE Comparison Value is based on the GRAV mass in the LC cut divided by the gas sample volume. For compound classes indicated by IR, the MATE comparison value is 100 percent of the GRAV concentration. For compound classes expected[65] but not identified by IR, the MATE Comparison Value is 10 percent of the GRAV concentration.

NOTE: MATE values are those in effect in January 1979.

TABLE A-130. MATE COMPARISON VALUES, TAR DECANTER VAPOR, CONDENSATE EXTRACT, pH 2

	Preliminary	Concentrate	LC1	LC2	LC3	LC4	LC5	LC6	LC7	Σ
Total organics mg/sm^3	207	176	0.61	20.6	19.4	5.65	7.12	96.8	0.0	150
TCO, mg	1,545	923	0.0	108	74	38	42	596	0.0	858
GRAV, mg	138	507	5.0	60	84	8.0	16	192	0.0	365

Category			LC1	LC2	LC3	LC4	LC5	LC6	LC7	Σ
			MATE comparison value, mg/sm^3*							
Aliphatic hydrocarbons			0.61							0.61
Halogenated aliphatics			0.06							0.06
Aromatic hydrocarbons				7.37	10.3	0.98	1.96	23.6		44.2
Halogenated aromatics				0.74	1.03	0.10	0.20			2.07
Heterocyclic N,O,S compounds						0.10	0.20			0.30
Sulfides, disulfides						0.10	0.20			0.30
Nitriles						0.10	0.20			0.30
Ethers						0.10	0.20			0.30
Aldehydes, ketones						0.98	1.96	2.36		5.3
Nitroaromatics							0.20	2.36		2.56
Alcohols						0.98	1.96	2.36		5.3
Amines							0.20	2.36		2.56
Phenols, halo and nitrophenols						0.98	1.96	23.6		5.3
Esters, amides						0.98	1.96	2.36		5.3
Mercaptans								2.36		2.36
Carboxylic acids								23.6		23.6
Sulfoxides								2.36		2.36

NOTE: The MATE Comparison Value is based on the GRAV mass in the LC cut divided by the gas sample volume. For compound classes indicated by IR, the MATE comparison value is 100 percent of the GRAV concentration. For compound classes expected[65] but not identified by IR, the MATE Comparison Value is 10 percent of the GRAV concentration.

NOTE: MATE values are those in effect in January 1979.

Table 9-104

LRMS REPORT

SAMPLE: Monsanto ferroalloy II-C1F-1

Major Categories

Intensity	Category	MW Range
1	Heterocyclic sulfur compounds	184

Sub-Categories, Specific Compounds

Intensity	Category	m/e	Composition
1	Dibenzothiophene	184	$C_{12}H_8S$

Other

Table 9-105

LRMS REPORT

SAMPLE: Monsanto ferroalloy II-C1F-2

Major Categories

Intensity	Category	MW Range
1	Heterocyclic sulfur compounds	184
1	Aromatic hydrocarbons	<280

Sub-Categories, Specific Compounds

Intensity	Category	m/e	Composition
1	Dibenzothiophene	184	$C_{12}H_8S$

Other

1 Benzenes below $^{m}/e$ 280

Table 9-106

LRMS REPORT

SAMPLE: Monsanto ferroalloy II-C1F-3

Major Categories

Intensity	Category	MW Range
100	Fused alternate/nonalternate hydrocarbons	>216
1	Fused alternate/nonalternate hydrocarbons	<216

Sub-Categories, Specific Compounds

Intensity	Category	m/e	Composition
100	Benzpyrenes, etc.	252	$C_{20}H_{12}$
100	Dibenzchrysene, etc.	276	$C_{22}H_{12}$
100	Dibenzanthracene	278	$C_{22}H_{14}$
10	Methyl-benzpyrenes, etc.	266	$C_{21}H_{14}$
10	Methyl-dibenzanthracene	292	$C_{23}H_{16}$
10	Dibenzpyrene, etc.	302	$C_{24}H_{14}$
1	Benzanthracene, etc.	228	$C_{18}H_{12}$
1	Methyl benzanthracene	242	$C_{19}H_{14}$
1	Pyrene/fluoranthene	202	$C_{16}H_{10}$
1	Anthracene/phenanthrene	178	$C_{14}H_{10}$
1	Biphenyl/acenaphthene	154	$C_{12}H_{10}$

Other

1	Fused alternate, nonalternate hydrocarbons $302 < m/e \leq 452$

Table 9-107

LRMS REPORT

SAMPLE: Monsanto ferroalloy, II-C1F-4

Major Categories

Intensity	Category	MW Range
10	Fused alternate/nonalternate hydrocarbons	>216

Sub-Categories, Specific Compounds

Intensity	Category	m/e	Composition
10	Dibenzpyrene	302	$C_{24}H_{14}$
10		326	
10	Dibenzchrysene	276	$C_{22}H_{12}$
10	Dibenzanthracene	278	$C_{22}H_{14}$
10	Benzpyrene, etc.	252	$C_{20}H_{12}$
1	Benzanthracene, etc.	228	$C_{18}H_{12}$

Other

1	Polycyclics to $^{m}/e$ 430

Table 9-108

LRMS REPORT

SAMPLE: Monsanto ferroalloy II-ClF-5

Major Categories

Intensity	Category	MW Range
10	Fused alternate/nonalternate hydrocarbons	>216
10	Ketones	304

Sub-Categories, Specific Compounds

Intensity	Category	m/e	Composition
10	Dibenzpyrene	302	$C_{24}H_{14}$
10	6-ring O (ketones)	304	
10		326	
1	Dibenzchrysene, etc.	276	$C_{22}H_{12}$
1	Dibenzanthracene, etc.	278	$C_{22}H_{14}$
1		277	

Other

TABLE 9-109

LRMS REPORT

SAMPLE: Monsanto ferroalloy, II-C1F-6

Major Categories

Intensity	Category	MW Range
100	Ketones	200-300+
100	Heterocyclic nitrogen compounds	200-300+
1	Esters	222
1	Carboxylic acids	122

Sub-Categories, Specific Compounds

Intensity	Category	m/e	Composition
		280	
100	6-Ring N	303	
100	6-Ring O (ketones)	304	
100	Dibenzacridine, etc.	279	$C_{21}H_{13}N$
10	Fluorenone	180	$C_{13}H_8O$
10	Phenanthridone	195	$C_{14}H_9NO$
10	Methyl phenanthridone	209	$C_{14}H_{10}NO$
10		219	
10	Benzacridine, anthraquinoline, etc.	229	$C_{17}H_{11}N$
10		230	
10	5-Ring-N (heterocyclic N)	253	$C_{19}H_{11}N$
10	5-Ring-O (ketone)	254	$C_{19}H_{10}O$
10		270	
10		277	
1	Benzoic acid	122	$C_7H_6O_2$
1	Diethyl phthalate	222	$C_{12}H_{14}O_4$
1		203	$C_{15}H_9N$
1		204	$C_{15}H_8O$

Other

1	Polycyclics with $300 < m/e \leq 500$

Table 9-110

LRMS REPORT

SAMPLE: Monsanto ferroalloy II-C1F-7

Major Categories

Intensity	Category	MW Range
1	Heterocyclic nitrogen compounds	223-303

Sub-Categories, Specific Compounds

Intensity	Category	m/e	Composition

Other

1	Azo compounds with $223 \le m/e \le 303$

Table 9-111

LRMS REPORT

SAMPLE: Monsanto ferroalloy II PW-1

Major Categories

Intensity	Category	MW Range
1	Aliphatics	200-450

Sub-Categories, Specific Compounds

Intensity	Category	m/e	Composition

Other

1 Aliphatics with $200 \le {}^{m}/e < 450$

Table 9-112

LRMS REPORT

SAMPLE: Monsanto ferroalloy II-PW-2

Major Categories

Intensity	Category	MW Range
10	Aromatic hydrocarbons	225

Sub-Categories, Specific Compounds

Intensity	Category	m/e	Composition

Other

10	Benzene substituted with aliphatic chain and N and Cl exterior to ring with $^m/e = 225$ ($C_{13}H_{20}NCl$)

Table 9-113

LRMS REPORT

SAMPLE: Monsanto ferroalloy II-PW-3

Major Categories

Intensity	Category	MW Range
100	Fused alternate/nonalternate hydrocarbons	<216
100	Fused alternate/nonalternate hydrocarbons	>216

Sub-Categories, Specific Compounds

Intensity	Category	m/e	Composition
100	Pyrene/fluoranthene	202	$C_{16}H_{10}$
100	Benzoanthracene, etc.	228	$C_{18}H_{12}$
100	Benzopyrenes, etc.	252	$C_{20}H_{12}$
10	Anthracene/phenanthrene	178	$C_{14}H_{10}$
10	Benzofluorene, etc.	216	$C_{17}H_{12}$
10		218	$C_{17}H_{14}$
10	Methyl-benzanthracene	242	$C_{19}H_{14}$
10	Diabenzchrysene	276	$C_{22}H_{12}$
10	Dibenzanthracene	278	$C_{22}H_{14}$
10	Diabenzpyrene	302	$C^{22}H^{14}$
10		326	

Other

1	Polycyclics with $326 < {}^{m}/e \leq 450$

LRMS REPORT Table 9-114

SAMPLE: Monsanto ferroalloy, II-PW-4

Major Categories

Intensity	Category	MW Range
100	Fused alternate/nonalternate hydrocarbons	>216
1	Fused alternate/nonalternate hydrocarbons	<216
1	Heterocyclic nitrogen compounds	217

Sub-Categories, Specific Compounds

Intensity	Category	m/e	Composition
100	Chrysene/benzanthracene	228	$C_{18}H_{12}$
100	Benzopyrene, etc.	252	$C_{20}H_{12}$
10	Diabenzchrysene	276	$C_{22}H_{12}$
10	Diabenzanthracene	278	$C_{22}H_{14}$
10	Diabenzpyrene	302	$C_{22}H_{14}$
10		326	
1	Benzocarbazole	217	$C_{16}H_{11}N$
1		242	$C_{19}H_{14}$
1		258	
1	Pyrene/fluoranthene	202	$C_{16}H_{10}$
1		376	

Other

<1	Polycyclics below 200
1	Polycyclics 380 $\leq$ $^{m}/e$ $\leq$460

Table 9-115

LRMS REPORT

SAMPLE: Monsanto ferroalloy II-PW-6

Major Categories

Intensity	Category	MW Range
100	Ketones	300+
10	Heterocyclic nitrogen compounds	200-300+
1	Esters	

Sub-Categories, Specific Compounds

Intensity	Category	m/e	Composition
100	Benzanthrone, etc.	230	$C_{17}H_{10}O$
10	Phthalate		
10		200	
10		202	
10		203	$C_{15}H_9N$
10		243	
10		244	
10	5-Ring N	253	$C_{19}H_{11}N$
10	5-Ring O (polycyclic aromatic ketone)	254	$C_{19}H_{10}O$
10		258	
10	Dibenzacridine, etc.	279	$C_{21}H_{13}N$
10		280	
10		302	
10	6-Ring N	303	
10	6-Ring O (ketone on 6 fused rings)	304	
1	Fluorenone, etc.	180	$C_{13}H_8O$

Other

1	Polycyclics with $305 \leq {}^{m}/e < 460$

Table 9-116

LRMS REPORT

SAMPLE: Monsanto ferroalloy II-PW-7

Major Categories

Intensity	Category	MW Range
10	Ketones	200-300+
1	Heterocyclic nitrogen compounds	179-300+

Sub-Categories, Specific Compounds

Intensity	Category	m/e	Composition
10	Benzanthrone, etc.	230	$C_{17}H_{10}O$
1	Acridine	179	$C_{13}H_9N$
1		203	$C_{15}H_9N$
1		204	
1		229	$C_{17}H_{11}N$
1		253	$C_{19}H_{11}N$
1		254	
1		279	$C_{21}H_{13}N$
1		280	
1	6-Ring N	303	
1		304	

Other

1	Polycyclics up to $^m/e$ 350

LRMS REPORT Table 9-117

SAMPLE: Monsanto ferroalloy coal CL-1

Major Categories

Intensity	Category	MW Range
100	Sulfur	256
100	Aliphatic hydrocarbons	270-414
10	Unidentified	186

Sub-Categories, Specific Compounds

Intensity	Category	m/e	Composition

Other

LRMS REPORT

Table 9-118

SAMPLE: Monsanto ferroalloy, coal CL-3

Major Categories

Intensity	Category	MW Range
100	Fused alternate/nonalternate HC ^{m}/e216	216->500
10	Fused alternate/nonalternate HC ^{m}/e216	178-216
10	Heterocyclic sulfur compounds	184-234
10	Sulfur	256

Sub-Categories, Specific Compounds

Intensity	Category	m/e	Composition
10	Anthracene/phenanthrene	178	$C_{14}H_{10}$
10	Methyl anth/phenanthrene	192	$C_{15}H_{12}$
10	Dibenzthiophene	184	$C_{12}H_{8}S$
10	Pyrene/fluoranthene	202	$C_{16}H_{10}$
10	Benzofluorenes, etc.	216	$C_{17}H_{12}$
10	Chrysene, etc.	228	$C_{18}H_{12}$
10	Methyl chrysene, etc.	242	$C_{19}H_{14}$
10	Benzopyrenes, etc.	252	$C_{20}H_{12}$

Other

100	Alkylated PAH + other polycylic species, ^{m}/e 206 to <500

Table 9-119

LRMS REPORT

SAMPLE: Monsanto ferroalloy coal CL-4

Major Categories

Intensity	Category	MW Range
100	Heterocyclic nitrogen compounds	167-323+
100	Fused alternate, nonalternate H/C >$^m/e$216	252-$\sim$500
1	Fused alternate, nonalternate HC < $^m/e$216	178-202
1	Sulfur	256
1	Esters	-

Sub-Categories, Specific Compounds

Intensity	Category	m/e	Composition
10	Carbazole	167	$C_{12}H_9N$
10	Alkyl carbazoles	181-237	$C_{13}H_{11}N$ - $C_{17}H_{19}N$
10	Benzo carbazole	217	$C_{16}H_{11}N$
10	Alkyl benzo carbazoles	231-287	$C_{17}H_{13}N$ - $C_{21}H_{21}N$
10	Dibenzo carbazole	267	$C_{20}H_{13}N$
10	Alkyl dibenzo carbazoles	281-323	$C_{21}H_{15}N$ - $C_{24}H_{21}N$
10	Chrysene/benzoanthracene, etc.	228	$C_{18}H_{12}$
10	Benzopyrenes, etc.	252	$C_{20}H_{12}$
1	Anthracene/phenanthrene	178	$C_{14}H_{10}$
1	Dihydro anthracene/phenanthrene	180	$C_{14}H_{12}$
1	Pyrene/fluoranthene	202	$C_{16}H_{10}$
1	Sulfur	256	S_8
1	Phthalate		

Other

100	Unidentified polycyclics (extensive alkylation present), other than those above, $^m/e$ 230 to >500

Table 9-120

LRMS REPORT

SAMPLE: Monsanto ferroalloy, coal CL-6

Major Categories

Intensity	Category	MW Range
100	Ketones	180- ∿350
10	Heterocyclic nitrogen compounds	179-223
10	Esters	

Sub-Categories, Specific Compounds

Intensity	Category	m/e	Composition
10	Phthalates		
10	Acridine	179	$C_{13}H_9N$
10	Fluorenone	180	$C_{13}H_8O$
10	Alkyl fluorenones	194-222	$C_{14}H_{10}O$ - $C_{16}H_{14}O$
10	Phenyl benzoquinone	184	$C_{12}H_8O_2$
10	Alkyl phenyl benzoquinones	198-240	$C_{13}H_{10}O_2$- $C_{16}H_{16}O_2$

Other

10	(each species) unidentified polycyclics, mostly alkylated, $^m/e$
	200 to $^m/e$ 350

LRMS REPORT Table 9-121

SAMPLE: Ferroalloy CK-1

Major Categories

Intensity	Category	MW Range
100	Sulfur	256
1	Aliphatics	320-440

Sub-Categories, Specific Compounds

Intensity	Category	m/e	Composition

Other

TABLE 9-122. TOTAL MASS OF EMITTED PARTICULATES

Series no.	I	II
Process	Silicomanganese	Ferromanganese
Sampling point	Outlet of Venturi Scrubber	Bypass stack
Volume of gas sampled	32.12 m^3	1.36 m^3
Total particulates		
10μ cyclone	0.0111 g	38.4706 g
3μ cyclone	1.8218	12.6509
1μ cyclone	0.0684	10.1065
filter	0.0319	19.3515
probe and cyclone rinses	0.1411	11.9077
Total	2.0743	92.4872
Total concentration		
10μ cyclone	0.34 mg/m^3	28,000 mg/m^3
3μ cyclone	56.	9,300
1μ cyclone	2.13	7,400
filter	0.99	14,000
probe and cyclone rinses	4.4	8,800
Total	64. mg/m^3	68,000 mg/m^3

TABLE 9-123. TOTAL ORGANICS (mg/m^3) FOR SASS TRAIN SAMPLES (I) OUTLET OF SCRUBBER, SILICOMANGANESE PROCESS

Compound categories	Particulates			Sorbent Module		Total
	>3μ*	>3μ*	Rinses	Resin	Condens.	
Aliphatic hydrocarbons			0.2	2.3	0.05	2.5
Aromatic Hydrocarbons			0.2	23		23
Fused aromatics <216				11	2.7	14
Fused aromatics >216					0.02	0.02
Ether				0.1	0.005	0.1
Ketone				0.8	0.01	0.8
Alcohol	~0.01	~0.01	0.2	0.1	0.004	~0.3
Ester			0.2	0.8	0.01	1.8
Amine					0.004	~0.1
Heterocyclic N				0.1		0.1
Heterocyclic S				1.7		1.7
Carboxylic Acid				0.7		0.7
Sulfides					0.005	~0.1
Amide					0.004	~0.1
Sulfur					0.2	0.2
Nitrite					0.004	~0.1
Silicone Compounds	~0.01	~0.01	0.2			0.004

*Concentrations estimated from IR and total TCO and Grav data only.

TABLE 9-124. TOTAL ORGANICS (mg/m³) FOR SASS TRAIN SAMPLES II BYPASS, FERROMANGANESE PROCESS

Compound categories	Particulates			Sorbent Module		Total
	>3μ*	<3μ	Rinses	Resin	Condens.*	
Aliphatic hydrocarbons		~0.1	1.9	3.9		6.9
Aromatic Hydrocarbons		~0.1	~0.1	3.5		3.7
Fused Aromatics <216		0.2	14	370		380
Fused Aromatics >216	4.5	33	22	390	0.3	450
Heterocyclic S				37		37
Heterocyclic N	1.1	7.9	0.8	70	0.07	80
Ketones	0.8	6.4	7.8	53	0.05	67
Alcohols			0.02			~0.1
Esters		0.06	0.08	0.8		0.9
Carboxylic Acids		0.06		4.2		4.3

*Concentrations estimated from IR and total TCO and Grav data only.

Table 9-125

ORGANIC EXTRACT SUMMARY TABLE

Sample IX, XAD-2 Extract, Silicomanganese

	LC1	LC2	LC3	LC4	LC5	LC6	LC7	Σ
Total Organics, mg/m^3	2.32	15.	19.	0.03	0.17	2.93	0.74	41.
TCO, mg	74.	480.	620.	1.1	5.6	44.	23.	1260.
GRAV, mg	<0.1	0	5.0	<0.1	<0.1	50	<0.1	65

Category	Int/mg/m^3							
Aliphatic Hydrocarbons	100/2.3							2.3
Aromatic Hydrocarbons		100/14	100/9.4	10/<<0.1*				23.
Fused Aromatics <216		10/1.4	100/9.4	10/<<0.1*				11.
Heterocyclic S Compounds		1/0.1	10/0.9			10/0.7		1.7
Ketones					10/0.01*	10/0.7	1/0.1	0.8
Esters					10/0.01*	10/0.7	1/0.1	0.8
Carboxylic Acids						10/0.7		0.7
Alcohols							1/0.1	0.1
Heterocyclic N Compounds							1/0.1	0.1
Ethers							1/0.1	0.1

*Concentration estimated from LC,IR data, with reference to LRMS data of LC3 and LC6

Table 9-126

ORGANIC EXTRACT SUMMARY TABLE

Sample ISC., Sorbent Condensate, Silicomanganese

	LC1	LC2	LC3	LC4	LC5	LC6	LC7	Σ
Total Organics, mg/m^3	0.26	0.05	2.70	0.002	0.008	0.008	0.008	3.0
TCO, mg	0.03	0.01	18.	0.06	<0.1	<0.1	0.02	18.
GRAV, mg	8.4	1.5	68.	<0.1	0.25	2.75	0.25	81.

Category	Int/mg/m^3							
Sulfur (S_8)	100/0.2							0.2
Aliphatic Hydrocarbons	1/0.002	100/0.05*						0.05
Fused Aromatics <216			100/2.7					2.7
Fused Aromatics >216			1/0.02					0.02
Nitrites							100/0.004**	0.004
Ketones						100/0.007	100/0.004**	0.01
Esters					100/0.004**	100/0.001	100/0.004**	0.01
Ethers				100/0.001**	100/0.004**			0.005
Sulfides				100/0.001**	100/0.004**			0.005
Amides							100/0.004**	0.004
Alcohols							100/0.004**	0.004
Amines							100/0.004**	0.004

*Concentration estimated from LC,IR data with reference to LRMS data of LC1

**Concentration estimated from LC,IR data only

Table 9-127

ORGANIC EXTRACT SUMMARY TABLE

Sample IIX, XAD-2 Extract, Ferromanganese

	LC1	LC2	LC3	LC4	LC5	LC6	LC7	Σ
Total Organics, mg/m^3	3.9	7.0	780	36.	6.7	88	17	940
TCO, mg	2.25	9.4	195	1.21	6.2	30	11	255
GRAV, mg	3.0	<0.1	870	48.	3.0	90	12	940

Category	Int/mg/m^3							
Aliphatic Hydrocarbons	100/3.9							3.9
Aromatic Hydrocarbons		10/3.5						3.5
Fused Aromatics <216		10/3.5	100/372	10/1.7				380.
Fused Aromatics >216			100/372	100/17				390.
Heterocyclic S compounds			10/37					37.
Heterocyclic N compounds				100/17	100/3.3	100/42	10/8.1	70.
Ketones (polycyclic aromatic)					100/3.3	100/42	10/8.1	53.
Carboxylic acids						10/4.2		4.2
Esters							1/0.8	0.8

Table 9-128

ORGANIC EXTRACT SUMMARY TABLE

Sample IICIF, Particulates <1μ, Ferromanganese

	LC1	LC2	LC3	LC4	LC5	LC6	LC7	Σ
Total Organics, mg/m^3	<0.1	<0.1	23	10	<0.1	13	1.5	48
TCO, mg	-	-	-	-	-	-	-	-
GRAV, mg	<0.1	<0.1	32	14	<0.1	18	2.0	66

Category Int/mg/m^3								
Aliphatic Hydrocarbons	<<0.2							<<0.2
Aromatic Hydrocarbons		<<0.2						<<0.2
Fused Aromatics <216			1/0.2					0.2
Fused Aromatics >216			100/23	10/10	<<0.2			33.
Ketones (polycyclic aromatic)					<<0.2	100/6.4		6.4
Heterocyclic N compounds						100/6.4	1/1.5	7.9
Esters						1/0.06		0.06
Carboxylic Acids						1/0.06		0.06

Table 9-129

ORGANIC EXTRACT SUMMARY TABLE

Sample II PW, Probe Wash, Ferromanganese

	LC1	LC2	LC3	LC4	LC5	LC6	LC7	Σ
Total Organics, mg/m^3	1.95	<0.1	28	7.8	0.54	7.2	1.44	47
TCO, mg	-	-	-	-	-	-	-	-
GRAV, mg	2.65	<0.1	39	11.	0.73	9.8	1.96	65

Category	Int/mg/m^3							
Aliphatic Hydrocarbons	1/1.9							1.9
Aromatic Hydrocarbons		<<0.2						<<0.2
Fused Aromatics <216			100/14	1/0.07				14.
Fused Aromatics >216			100/14	100/7.7	100/0.2*			22.
Heterocyclic N compounds				1/0.07		10/0.6	1/0.1	0.8
Ketones (polycyclic aromatic)					100/0.2*	100/6.5	10/1.3	7.8
Esters					10/0.02*	1/0.06		0.08
Alcohols					10/0.02*			0.02

*Concentration estimated from LC,IR data with reference to LRMS data of LC4 and LC6

Table 9-130

ORGANIC EXTRACT SUMMARY TABLE

Sample Coal (CL)

	LC1	**LC2**	**LC3**	**LC4**	**LC5**	**LC6**	**LC7**	**Σ**
Total Organics, mg/m^3	286	24.	101	35.	13.	62.	10.	530
TCO, mg	0.36	<0.01	0.80	0.014	<0.01	0.29	<0.01	1.2
GRAV, mg	24	2.0	7.7	2.9	1.1	4.9	0.86	43.

Category	**Int/mg/kg**							
Sulfur	100/143	100/12*	10/7.8	1/0.17	1/0.06*			160
Aliphatic Hydrocarbons	100/143	100/12*						160
Fused Aromatics <216			10/7.8	1/0.17	1/0.06*			8.0
Fused Aromatics >216			100/78	100/17	100/6.4*			100
Heterocyclic Sulfur			10/7.8					7.8
Heterocyclic Nitrogen				100/17	100/6.4*	10/5.6	10/0.90*	30
Esters				1/0.17	1/0.06*	1/0.56	1/0.09*	0.88
Ketones						100/56	100/9.0*	65

*Estimated from LC and IR data, with LRMS data of adjacent LC fractions

Table 1-131

ORGANIC EXTRACT SUMMARY TABLE

Sample Coke (CK)

	LC1	LC2	LC3	LC4	LC5	LC6	LC7	Σ
Total Organics, mg/m^3	158	<1.5	16.	14.	22.	10.	10.	230
TCO, mg	0.36	<0.01	0.14	<0.01	<0.01	<0.01	<0.01	0.50
GRAV, mg	10.	<0.01	0.86	0.86	1.4	0.6	0.6	14.3

Category	Int/mg/ kg							
Sulfur	100/156							160.
Aliphatics	1/2.0		100/13**					15.
Halogenated Aromatics			10/1.3**	10/1.4**				2.7
Aromatic Hydrocarbons			10/1.3**	10/1.4**				2.7
Heterocyclic N, O, S				10/1.4**	10/2.2**			3.6
Sulfides, Disulfides				10/1.4**	10/2.2**			3.6
Nitriles				10/1.4**	10/2.2**			3.6
Ethers				100/7.0**	10/2.2**			9.2
Alcohols				100/7.0**	10/2.2**	100/5.0**	100/5.0**	19.
Aldehydes, Ketones					10/2.2**	100/5.0**	10/1.0**	8.2
Nitroaromatics					10/2.2**	10/1.0**	10/1.0**	4.2
Amines					10/2.2**	10/1.0**	100/5.0**	8.2
Phenols						10/1.0**	10/1.0**	2.0
Esters, Amides						10/1.0**	10/1.0**	2.0
Carboxylic Acids						100/5.0**	10/1.0**	6.0
Sulfoxides						10/1.0**	10/1.0**	2.0

**Estimated from LC and IR data, no LRMS data available

LEVEL 2

TABLE 18

GC/MS Polycyclic Organic Matter (POM) Analysis

Sample Series: I, Silicomanganese, after scrubber

Concentration: mg/m^3

Species \ Sample	m/e	I C310	I CIF	I PW	I X	I SC	Total
Fluorene	165+6	*		0.00012	0.86	0.62	1.5
Anthracene/Phenanthrene	178	0.00016	0.00039	0.00064	0.83	1.30	2.1
Carbazole	167						
Methyl-Anthracenes	192				0.42	0.028	0.070
Isomers	192					0.018	0.018
Fluoranthene	202	0.000058	0.00019	0.00049	0.044	0.20	0.24
Pyrene	202	0.000042	0.00015	0.00017	0.046	0.17	0.22
Methyl Pyrene /Methyl Fluoranthene	216					0.005	0.005
Chrysene/Benzo(a)anthracene/etc.	228					0.016	0.016
Methyl Chrysenes	242						
7,12-Dimethyl Benz(a)anthracene	256						
Benzofluoranthene, Benzo(e)pyrene	252						
Benzo(a)pyrene	252						
Perylene	252						
Methyl Benzopyrenes	266						
3-Methylcholanthene	268						
Indeno (1,2,3-cd) Pyrene	276						
Benzo(ghi)Perylene	276						
Dibenzo(a,h)anthracene	278						
Dibenzo(c,g) carbazole	267						
Dibenzo(ai & ah)pyrenes	302						
Coronene	300						
TOTAL		0.00026	0.00073	0.0014	1.82	2.40	4.2

*All blanks are items not detected, detection limit 0.01 μg/m^3

TABLE 19

GC/MS Polycyclic Organic Matter (POM) Analysis

Sample Series: II, Ferromanganese, bypass

Concentration: mg/m^3

Species \ Sample	m/e	II C310	II CIF	II PW	II X	II SC	Total
Fluorene	165+6	0.0014			16.3	0.0077	16.
Anthracene/Phenanthrene	178	0.054	0.014	0.62	222.	0.081	220.
Carbazole	167	*			9.6	0.014	9.6
Methyl-Anthracenes	192	0.0018		0.18	24.	0.0044	24.
Isomers	192					0.0034	0.0034
Fluoranthene	202	0.034	0.0055	2.46	220.	0.039	220.
Pyrene	202	0.019	0.0057	2.28		0.031	2.3
Methyl Pyrene/ Methyl Fluoranthene	216			0.54	14.		14.
Chrysene/Benzo(a)anthracene/etc.	228	0.048	0.026	3.40	46.	0.0063	49.
Methyl Chrysenes	242	0.00065			5.24		5.2
7,12-Dimethyl Benz(a)anthracene	256				0.58		0.58
Benzofluoranthene, Benzo(e)pyrene	252	0.031	0.26	3.13	47.	0.0041	51.
Benzo(a)pyrene	252						
Perylene	252	0.036	0.29	2.82		0.0041	3.1
Methyl Benzopyrenes	266		0.026	0.50	0.67		1.20
3-Methylcholanthene	268		0.053	0.34			0.39
Indeno (1,2,3-cd) Pyrene	276	0.029	0.26	0.47	5.28		6.0
Benzo(ghi)Perylene	276	0.099	0.55	0.71			1.4
Dibenzo(a,h)anthracene	278	0.0041	0.12		0.78		0.90
Dibenzo(c,g) carbazole	267	0.079					0.079
Dibenzo(ai & ah)pyrenes	302	0.15	0.23	0.16			0.54
Coronene	300	0.10	0.29	0.12			0.51
TOTAL		0.68	2.1	17.	612.	0.19	660.

*All blanks are items not detected, detection limit 0.3 µg/m^3

ADDITIONAL DATA

Table 8

Total Extractable Organics, mg/m^3

	I			II		
Process	Silicomanganese			Ferromanganese		
	TCO	GRAV	TOTAL	TCO	GRAV	TOTAL
Particulates extract						
10 + 3μ	—	∿0.03	∿0.03	--	6.6	6.6
1 + filter	—	∿0.03	∿0.03	—	48.	48.
probe and cyclone rinse extract	--	0.47	0.47	--	37.	37.
XAD-2 extract	45	2.18	47	205	910	1110
Sorbent condensate extract	0.57	2.02	2.59	0.41	∿0.1	0.41

Table 20

Total Polycyclic Organic Matter Data Comparison

Series	**I**		**II**	
Process	Silicomanganese		Ferromanganese	
Sampling Location	After Scrubber		Bypass	
	Total POM			
	mg/m^3		mg/m^3	
	Polynuclear Aromatics			
	Level 1	**GC/MS**	**Level 1**	**GC/MS**
SASS Sample				
C310	∿0.01	0.00026	4.5	0.60
C1F	∿0.01	0.00073	33	2.1
PW	∿0.01	0.0014	36	17
XAD-2	11	1.8	760	602
SC	2.7	2.4	0.3	0.2
Total	14	4.2	840	650
	Heterocyclic N Compounds*			
SASS Sample				
C310			1.1	0.8
C1F			7.9	
PW			0.8	
XAD-2	0.1		70.	9.6
SC			0.07	∿.01
Total	0.1	-	80	9.7

* Carbazole and Dibenzocarbazole were the only two heterocyclic N species determined in GC/MS analysis.

Table 37

Summary of Organic Analysis Results: Major Components

Concentration, mg/m³ *

Process	Ferromanganese	Silicomanganese
Sampling Site	Upstream of Venturi	Downstream of Venturi
Compound Categories		
Aliphatic Hydrocarbons	6.9	2.5
Aromatic Hydrocarbons	3.7	23
Fused Aromatics < 216 MW	380	14
Fused Aromatics > 216 MW	450	0.02
Heterocyclic N	80	0.1
Heterocyclic S	37	1.7
Ketones	67	0.8
Esters	0.9	1.8
Carboxylic Acids	4.3	0.7
Organic Gases (GC1 & GC2)	1,030ppm	3,090ppm

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* Gas volumes are corrected to standard conditions of 101 KPa (29.9" Hg) 2nd 21.1°C (70°F).

Table 36

Summary of Particulate Emission Data

Sampling Site	Upstream of Venturi	Downstream of Venturi
Process	Ferromanganese	Silicomanganese
Effluent Flow Rate		
m^3/sec	1.20	1.51
m^3/hr	4300	5400
Particulated Concentration		
mg/m^3	68000	64
Particulate Emissions		
kg/hr	290	0.35
Average Furnace Power		
MW (megawatt)	17.3	22.5
Particulate Emissions		
kg/MW-hr	17	0.016

Table 38

Summary of Process and Effluent Parameters

Sampling Site	Upstream of Venturi	Downstream of Venturi
Process	Ferromanganese	Silicomanganese
Electrode Consumption		
lb/day*	6,150	9,000
lb/m^3 of stack gas **	0.059	0.069
Coal/coke content of Feed, %*	14.5	14.9
Emissions, mg/m^3		
Total Organics (SASS train)	1,200	50
Total Aromatics	830	26
Aromatics of MW> 216	450	0.02
Volatile Organics (GC1 & GC2)	1,030	3,090

* Calculated from data in Table 1
** Calculated from data in Tables 1 and 6

Table 39

Comparison of AAS and SSMA Data for Arsenic and Antimony in Selected Samples

	Arsenic mg/m^3		Antimony $\mu g/m^3$	
Sample	AAS	SSMS	AAS	SSMS
Particulates				
I C 310	0.018	0.022	0.02	0.39
II C 310	24	MC* (>27)	150	660
II C IF	25	MC* (>21)	88	840
Impingers				
I Imp I	0.0062	0.0068	0.025	n.d.**
II Imp I	0.15	0.15	1.3	n.d.**
Solids Parr Bombed for SSMS				
I x	0.098	n.d.**	1.	n.d.**
II x	1.03	n.d.**	19.	n.d.**
Coal	20 mg/kg	11 mg/kg	0.3 mg/kg	0.9 mg/kg
Coke	20 mg/kg	14 mg/kg	0.6 mg/kg	1 mg/kg

* Major Component

** Not detectable, or < 0.1 ppm weight in sample analyzed.